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Headmaster of the County School, Harrow, Formerly of
the Education Department, Simla. Author of "The Kingdom
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PART III.

SCALES AND DIRECTION, SURVEYING, PROJECT-
IONS. GEOLOGY, FLORA AND FAUNA.
ASIA, AUSTRALASIA.

LONDON

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A RATIONAL GEOGRAPHY

BY

ERNEST YOUNG, B.Sc.

In three parts, with numerous Maps and Diagrams, Cloth, crown 8vo, 1s. 9d. each.

PART I.—CLIMATE, THE BRITISH ISLES, EUROPE.

PART II.—TIDES, WINDS, CURRENTS, LATITUDE AND LONGITUDE, AMERICA, AFRICA.

PART III.—MAP DRAWING, MAP PROJECTION, GEOLOGY, FLORA AND FAUNA, ASIA, AUSTRALASIA.

In all three Parts directions are given for the use of various instruments used in the study of Geography.

This is a new work on the most modern lines, and so arranged that it meets the requirements of all the ordinary Preliminary and Junior University Local Examinations. It is also intended to meet the requirements of the Board of Education's Syllabus for three out of the Four Years' Course in Geography.

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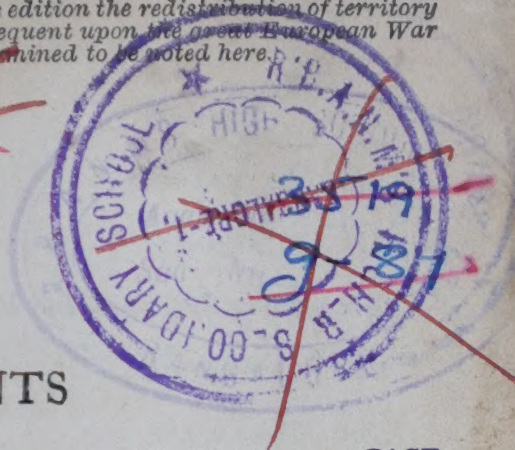
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INTRODUCTION

THIS work represents an attempt to meet the requirements of the Board of Education's Syllabus in Geography for Secondary Schools. It also endeavours to provide candidates for various examinations with a textbook in which they will find all the material usually required with reference to political and physical geography, and also information on such subjects as the making and reading of maps, the use of certain simple surveying instruments, methods of collecting data affecting climate, the use of such instruments as the sextant, etc., and the reading of weather charts and forecasting the weather. The boy who works through this book will have made an elementary study of all the continents, of much of what is called physiography and commercial geography, and will have gained a practical acquaintance with many scientific instruments used in the study of geography.

It is primarily intended for those schools taking the Board of Education's Course in Geography, and such schools should use the work as it stands, taking Parts I-III in three successive years.

Information which can be obtained from a map is usually not given in the text, but deduced from a series of questions upon the maps themselves. In some cases this has been carried so far that it is impossible for a boy to read the text or to answer the questions set for home work without constant reference to a map. Many maps not to be found in an ordinary atlas, such as those showing the distribution of sheep, cattle, etc., the direction of isobars and isotherms for the different continents, have been inserted in the text so that they can be easily referred to.

The following extracts from the Board of Education's Regulations are in a way a synopsis of the work, and an account of some of the methods adopted and of the author's aims :—

"The time allotted to Geography should be not less than two periods of school-work and one of home-work. One of the school periods should be largely devoted to dealing orally with exercises and home-work."

"It is desirable that the teacher should frame for each Term a plan for the teaching of the selected portion of the subject, including the sections of the textbook used to supplement the oral instruction."

Each part of this work contains about thirty-six chapters. As there are about thirty-six weeks in the school-year, there is ample time to go over the whole of the subject matter carefully and then to revise; for many of these lessons would certainly not take more than one period of school-work, although in the earlier part of Part I two periods of school-work may have to be given to one chapter.

"The aim of the teacher should be to produce a vivid impression of connected facts through considerations such as those of cause and effect and practical bearings of the facts selected."

A mere glance at the headings of the chapters will show how connected facts have been grouped, and in all cases it has been the author's aim to show the connexion of cause and effect.

"Each scholar should possess an atlas. . . . Where the teacher has not . . . special knowledge textbooks should be chosen with special regard to succinctness, clearness, and accuracy. Teachers should accustom themselves to bring the information given on commercial and political geography up to date. Statistics, as such, should be avoided; but if they are used in the later years of the Course, they should be verified in round numbers by the teacher."

The author hopes that he is both clear and accurate. The work is certainly not overloaded with statistics. Teachers who require statistics for special purposes can usually obtain them from such books as the *Statesman's Year Book*, *Whitaker's Almanack*, etc. Certain statistical statements have, however, been given, but always with the object of showing how these can be represented in a striking manner by means of curves, diagrams, etc., which the pupil is expected to make for himself from the data provided.

"Wall maps should be large, clear, and up to date, and should be in constant use by the teacher."

The new "Comparative Series" of wall maps, published by Messrs. G. Philip & Son, are probably the best of their kind, and the author has had them constantly in his mind in writing this work.

"The scholars should be trained to follow the teaching each by means of his own atlas. Atlases should be simple, i.e. not crowded with names nor overburdened with detail of any kind; relative land levels and sea-depths should be indicated by colour gradations. For teaching of physical and commercial geography, separate maps should, if possible, be used."

For those who want a cheap atlas Philips' Elementary Atlas of Comparative Geography is recommended as fulfilling the above conditions; but for those who can afford it the collection of maps, etc., from L'Estrange's Geography is the latest and best of modern atlases for school use. For not only is it clear and not overburdened with detail, etc., but it contains a unique collection of maps, showing for each continent the distribution of population, rainfall, winds, isotherms, etc., etc. The diagrams in the text of this work are useful, but they can never have the striking effect of the coloured diagrams from which they were made and which are contained in the above atlas.

"Globes of a suitable size for class demonstrations, diagrams, relief models, specimen products, photographs, and a collection of county and detailed maps for reference are recommended."

Those wishing to obtain specimen products and photographs from other countries should communicate with Mrs. E. M. Ord Marshall of the League of Empire, Caxton Hall, Westminster, who will show them how such material can be readily collected.

"Questions and answers (graded in difficulty from year to year) designed to elicit, through causes and consequences, subject matter for entry in the scholar's notebooks. No facts should be stated without reasons; and the reasons are best expressed by the class itself."

A set of questions is appended to each lesson. In Part I these questions include map exercises, questions on the

text and on the scholar's own neighbourhood. The questions have mostly been chosen from various examination papers, and the teacher will select those suitable to the age of his scholars or to the examination for which they are preparing. In Parts II-III the questions are as a rule arranged as follows: (i) Scientific; (ii) Revision question dealing with work learned in the First and Second Years; (iii) A map exercise; (iv and v) Exercises on the text of the particular section being studied at the time.

The letters O.S., C.S., etc., refer to the Oxford and Cambridge Local Examinations. The letters L.J.S. refer to the Junior School Examination of London University. The author wishes to acknowledge his indebtedness to the several universities for the permission given to him to make use of these questions.

"Scholars' notes should not contain merely the reproduction of lessons, but worked-out problems together with original maps and plans."

"Maps and diagrams should be regularly set, and in each case with a definite object, i.e. to illustrate a lesson from a particular point of view, physical, political, commercial, etc., no extraneous names or signs being inserted. Scholars should be required to justify each name, etc., inserted."

Maps illustrating definite objects are asked for in Part I chiefly in the Revision Exercises, because at this stage the time taken to do them in the lesson itself would be excessive. But in Parts II and III the illustrative maps are expected to be done in the lesson itself. Revision maps intended merely to fix in the mind the positions of important places are given in the revision exercises in all three parts.

In conclusion the author wishes to acknowledge his indebtedness to two recent works, both of which ought to be in the hands of every teacher of geography no matter what textbook his class may use, viz., *A Course of Comparative Geography* by L'Estrange; and *Practical Geography*, by Simmons and Richardson.

E. Y.

LOWER SCHOOL OF JOHN LYON,
HARROW.

A RATIONAL GEOGRAPHY

PART III

CHAPTER I

SCALES AND DIRECTION ¹

IF you are an intelligent cyclist or pedestrian, you have often looked at a map in order to find (a) the distance between two places, (b) the way from one place to another. Two of the most important things to be learned from a map are distance and direction. But a good map may show many other things, such as the height of the land, the depth of the sea, or perhaps the character of the vegetation, the roads, railways, etc.

The first part of this section is devoted to showing you how maps are to be made and read. If you can find time to make a few maps yourself by one or other of the methods given in these chapters, you will find the exercise one of considerable profit and interest.

Scales.—Suppose you wish to make a plan of your class room. It is obvious that the plan cannot be as large as the room. Let one side of the room be 20 ft. long. We can arrange that on our plan, half an inch shall represent one foot. Then the line representing the wall 20 ft. long will be 10 in. long. As a foot is represented by half an inch, every line on our plan will be $\frac{1}{2}$ of the length of the corresponding line in the room. The scale used is called a scale of $\frac{1}{2}$, and this fraction is called the **Representative Fraction**.

Such a scale as the one we have just used would only do for a small place like a room. If we were to try to draw a map of Rutland, the smallest English county, and if in this case we took half an inch to represent 50

¹ For much interesting information about maps, globes, etc., see *Maps and Map Drawing*. Elderton. Macmillan.

yards, we should want a sheet nearly 8 yards square.

Many Ordnance Maps are drawn on a scale of 1 in. to a mile. Now a mile contains 63,360 inches. Therefore the representative fraction (R.F.) is $\frac{1}{63360}$. The scale adopted for the military map of South Africa is 1 to 250,000.

On some of the Ordnance Maps a mile is represented by 6 inches. What is the representative fraction?

The scale of half an inch to a foot is used by engineers and architects for detailed drawings and is called "half-inch scale."

Use squared paper, and on it draw, on a scale of 50 yards to 1 inch, a football ground 120 yards long and 75 yards wide.

Direction.—The direction in which it is necessary to travel to get from one place to another can be obtained from a map. An arrow, or some other mark on the map, shows in which direction the north lies. You are at the

village of A, and you wish to go to B. The map shows that B lies due east of A. The next thing to be done is to find which way to go in order to travel east. As a rule a traveller or an explorer finds the north and south, and then finds all other directions by reference to these. How, then, can we find the points north and south?



FIG. 1.—MEASUREMENT OF THE SUN'S SHADOW.

With stick as centre and length of shadow as radius describe a circle. In the afternoon mark the position on this circle of the point where the shadow again reaches it. Join this point to the stick and bisect the angle between the two lines.

(ii) Point the hour hand of your watch to the sun. Mid-way between the hour and xii is the position of due south.

At Night.—Look out for the group of stars called the

In the Day-time.—(i) Put a smooth round stick in the ground in the morning. Note the end of the shadow.

Plough. Notice the position of the two stars called the Pointers. Draw in imagination a line through them. At about $4\frac{1}{2}$ times the distance between the two Pointers you will see a bright star. This is the North Polar Star, and it is practically over the North Pole. A person at the North Pole has the North Polar Star practically right over his head at all times of the year.

But it may be cloudy either by day or by night, and it may therefore be impossible to see either sun or moon. The north can then be found by means of a mariner's compass. This consists of a magnetised needle balanced on a point so that it can turn easily in any direction. Underneath it is a card marked with the points of the compass. Now the earth acts as a great magnet in such a way that wherever you may be, the north pole of the needle turns towards the North Pole of the earth.



FIG. 2.—POLE STAR, ETC.

Examine the compass card. The four chief points are marked N., S., E., W. These are the four cardinal points. What is the angle between them? There are 28 other points marked on the card, and the whole of the 32 points taken together are called the Points of the Compass. What angle is there between two adjacent points?

A man walks 1 mile due S. from O to A, then successively $2\frac{1}{2}$ miles E.S.E. from A to B, $3\frac{1}{4}$ miles N.E. from B to C, $3\frac{1}{4}$ miles due west from C to D,

and then finally straight from D to his starting point O. Draw a plan of his walk, taking 1 inch to represent 1 mile. Give the length of DO in miles (Navy, November, 1901).

From two points A and B on a line of earthworks, the bearings of a Boer gun were respectively N. 16° E. (that is, 16° East of North) and due North. If B is East-south-east of A, and 2,000 yards from it, find the distance of the gun from A. Scale, 1,000 yards to an inch (Navy, March, 1902).

Put the compass on a drawing board in the middle of your class room. Find the N., S., E. and W. points in the room.

Draw the east and west line on a piece of paper pinned on the board. What objects in the room are (a) north, (b) south of this line?

On the first sunny day, draw the true north and south line, as determined by the sun, either on the ground or on the floor of your class room. Now place the centre of your



FIG. 3.—MARINER'S COMPASS.

compass on this line. You will find that the north and south line given by the compass does not agree with that given by the sun. There are then two north and south lines. There are two north poles. One of these, the one beneath the North Polar Star, is the geographical north pole, while the other, the one to which the compass needle points, is the magnetic north pole. Try and measure the angle between the two north and south lines. Is the magnetic meridian east or west of the geographical meridian? The angle between the two meridians is called the Magnetic declination. In 1905 the declination was $16^{\circ} 10' 6''$ W. If you wish to find the true north, you must know the declination at the place where your observations are made, for this declination is not everywhere the same. In 1904 the declination at Paris was $14^{\circ} 30'$ W. If a man had drawn a line on a map, north and south by the compass, he would have had to draw another line

14° 30' to the east of it, to get the true north and south line. Again, the magnetic declination changes from year to year, so that it is necessary, even in the same place, to know the declination for each year if the true north and south is to be found by means of a compass.

The mean magnetic declination at Greenwich from 1896-1905 was as follows (to the nearest minute) :—

1896	16°52'W.	1901	16°26'W.
1897	16-46	1902	16-23
1898	16-39	1903	16-19
1899	16-34	1904	16-15
1900	16-29	1905	16-11

REVISION EXERCISES

1. Irish time is about 25 minutes slow by standard time in Great Britain. Explain fully the meaning of this statement. O. J., 1906.
2. On a map of England and Wales mark the Pennine Chain, the Cotswold Hills, the Lake District, the rivers Great Ouse and Severn, and the towns York, Birmingham, Exeter, and Dover. Trace the course of one of the main lines of railway from London to Carlisle. O. P., 1906.
3. On a map of Asia insert four rivers, and two lakes or inland seas, the island of Formosa and the Gulf of Pechili. Mark and name the towns Paku, Kabul, Lhasa, Manilla, Mecca, Port Arthur, Shanghai, Smyrna, Teheran, Tomsk, Vladivostok, and also the Hindu Kush Mountains, the Altai Mountains, and Mount Fuji (Fusi-Yama). C. J., 1906.
4. A village A is 5 miles from another village B, and 4 miles from a third C, while B is 6 miles from C. Draw a map, stating what scale you choose, and determine the position and distance from A of a church which is 2 miles from C and 4 miles from B.

(From *A First Year's Course in Geometry and Physics*, Young.)

5. A man walks 7 miles N.E., then 5 miles N., then 6 miles N.W. How far is he in a direct line from his starting point?

(From *A First Year's Course in Geometry and Physics*, Young.)

CHAPTER II

ELEMENTARY SURVEYING

THERE are several simple methods by means of which you may make a map of a small area.¹

¹ Actual surveys have to be made on half-holidays. They take much too long a time, for it to be possible to carry them out during school hours.

I. Plane-Table.—A plane-table consists of a drawing-board and a stand on which to place it. It can be carried

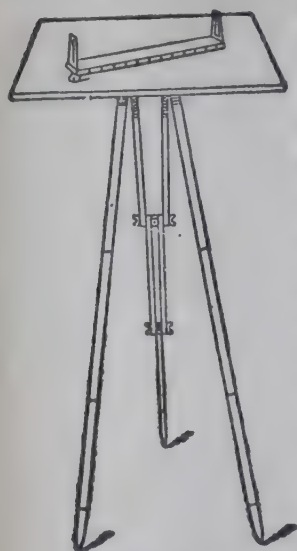


FIG. 4.
PLANE-TABLE.

separately from the stand, and it can be turned about without moving the legs of the tripod which supports it. The accessories comprise (a) a sight rule, (b) a spirit level, (c) a compass, (d) a surveyor's chain or tape. The sight rule is merely a ruler with "sights" at each end. The back-sight has a narrow slit in it, and the fore-sight has also a slit, but in this case it has a vertical wire fitted into it. The method of using the instrument is soon learned in practice, and you should make a plan of the school ground and buildings, in the way indicated. For your first experiment choose a piece of ground that is not too

irregular in outline, and that does not contain too many objects.

Suppose that your ground is of the shape shown in the figure (Fig. 6). Choose the most level piece of ground you can find.

Fix two cricket stumps at the end of a long straight line. Measure this line as accurately as you can with chain or tape. (See note on use of chain below.) Fix the tripod at A, with the centre of the table exactly over A. Pin a sheet of paper on the table. Draw a line on this paper showing the four cardinal points as determined by a compass. Sight the point B, and draw the direction of the line AB. Mark the position of B on this line, on some convenient scale, say 1 in. to 1 chain. Now, without moving the table, draw lines from the point A to the points marked 1-10. State on each line to what point it goes. Go to the point B. Set up the plane-table and sight



FIG. 5.—SIGHT RULE.

the point A. Turn the board until A lies in the direction BA. Then draw lines from B to the points 1-10 as before. You can insert any trees, seats, etc., in the same way.

Use a plane-table to make a plan of a walk. Choose a walk or road by means of which you can get back to your

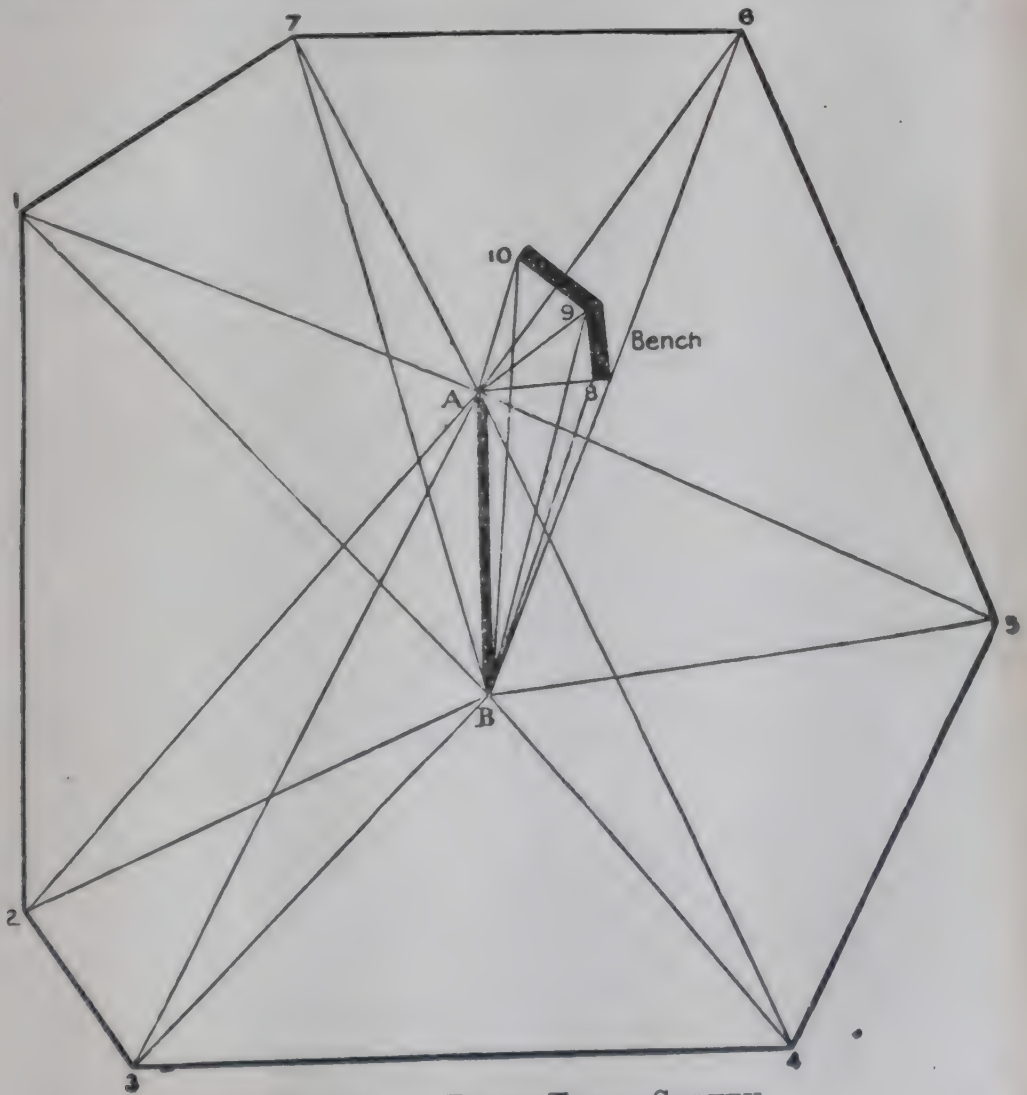


FIG. 6.—A PLANE-TABLE SURVEY.

starting-point. Place the plane-table at A. Mark the four points of the compass as before. Observe B with the sight-rule, and draw the line AB. Measure AB and set off the distance to some convenient scale (remember that you have to get the whole of your walk on the sheet of paper). Go to B. Fix the table so that your line BA

his handle. He then lifts the chain clear of the arrow and walks on. The chain is again set as before, and a second arrow put to mark the position of the forward end. The follower picks up the first arrow and moves on. At the end of the measurement, the number of arrows in the hand of the follower is the number of chains that have been measured.¹

II. Chain.—It is possible to survey a small area with a chain and a tape. The measurements are made on the ground, but the plan is afterwards drawn to scale at home. The method will be understood by studying the accompanying figures and plan. The figures form the data for making a plan of a small field. (See Fig. 8.)

	Links.	
	To F	
	536	
To E 194	472	To D 185
To C 152	357	
	180	To B 120
	From A	

The surveyor measured the distance from A to F. When he arrived opposite B, he was at link 180 (there are 100 links in a chain), and the perpendicular distance from this point to B was 120 links. Survey your school playground in the same way. A little thought will show you how you can insert the buildings and other objects of interest.²

III. The Prismatic Compass.—The prismatic compass has a magnetised needle moving on a card marked with

¹ Plane-tables and accessories are very cheap. Those figured here are made by Messrs. Philip Harris and Co., Birmingham. A complete set, including a clinometer for use as shown hereafter, and one plane-table is sufficient for ten pupils.

² The figures given are not actually taken from a surveyor's note book, as no surveyor, using merely a chain and tape, would take an offset at right angles to the chain, 120 links in length. The figures are merely given to enable the student to understand the method adopted.

360°. There is a sight at S with a vertical line I down the centre. There is a prism at P. Look through the little hole on the left, and turn the instrument till the line I coincides with some prominent object. You can see the object and the number of degrees by which that direction diverges from north, both at the same time. The method of surveying will be understood from the following figures and diagram.¹ We have here the page from the surveyor's note-book as he wrote it in the field, and the plan which he afterwards made at home.

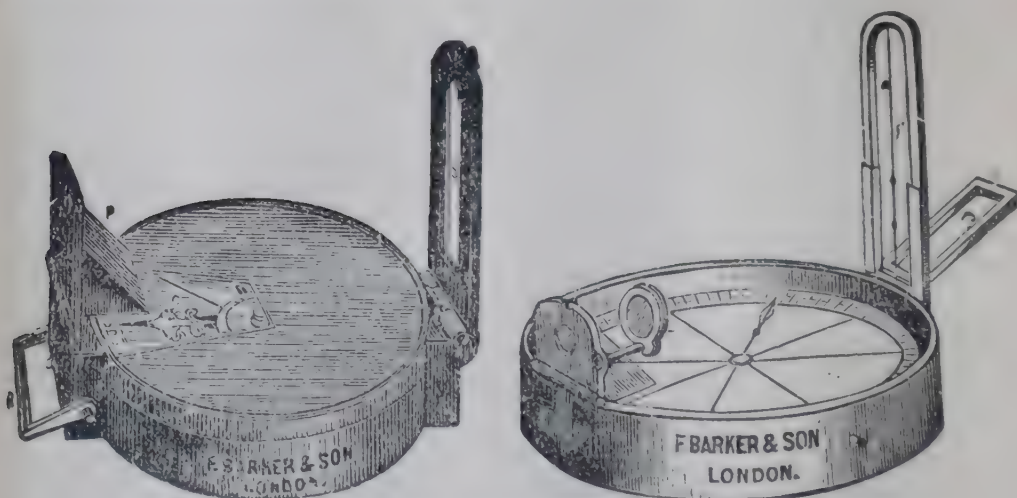


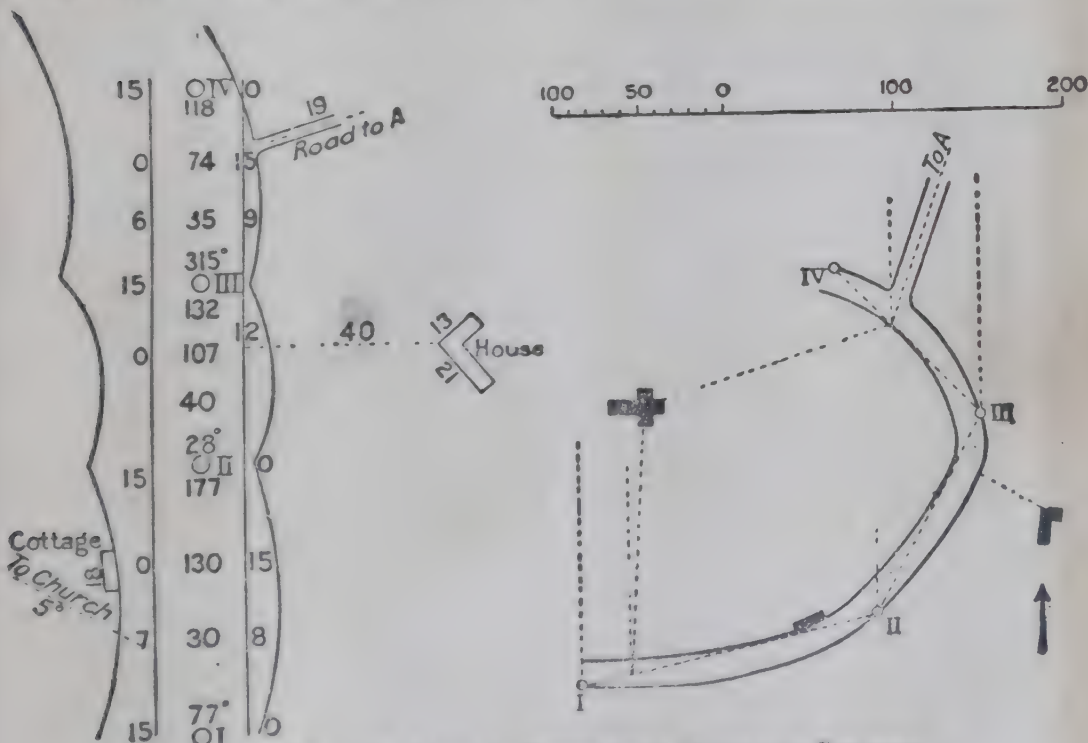
FIG. 9.—PRISMATIC COMPASSES.

Start at station I, and look to station II. The divergence of this line is 77° from the north. Measure the line. It is 177 yards long. Write 77° just above °I in the note-book, and 177 just under II in the note-book. The curves on the sides of the central column indicate the way in which the road bends. At 30 yards from I, you are 8 yards from the right hand side of the road, and 7 yards from the left hand side of the road. Sight the church. The line of sight diverges 5° from the north. At 130 yards from I you touch the left hand side of the road. The right hand side is 15 yards away. At this point there is a cottage which is 18 yards long.

¹ These are taken from Elderton's *Maps and Map Drawing*, by the kind permission of the publishers, Messrs Macmillan & Co

Go to station II and sight station III. This line of sight diverges 28° from the north. Write 28° above II. Measure the line. It is 132 yards long. Write 132 under III. At a point 74 yards from III, the church is observed again. The angle measured this time is 251° .

In actual practice the surveyor observes and registers the directions of objects, etc., as he goes along. You will find it more convenient in the one or two simple compass surveys that you may make to measure the whole distance



FIGS. 10 AND 11.—A PRISMATIC COMPASS SURVEY.

from one station to the other first, and then go back to the first station and insert the various details required.

To plot the survey, proceed as follows. Choose a convenient scale. Draw on your paper a line to represent north and south. Fix the point I. With a parallel ruler draw a line parallel to the north and south line. Make an angle at I equal to 77° with a protractor. Draw a line. Cut off a length 177 yards. This gives you point II.

The Theodolite.—In making a map of a country the theodolite is used. This is a telescope, so arranged that, when it is turned, the angle through which the telescope

has been turned can be read with very great accuracy. Look at Fig. 13. AB is a base line which has been drawn

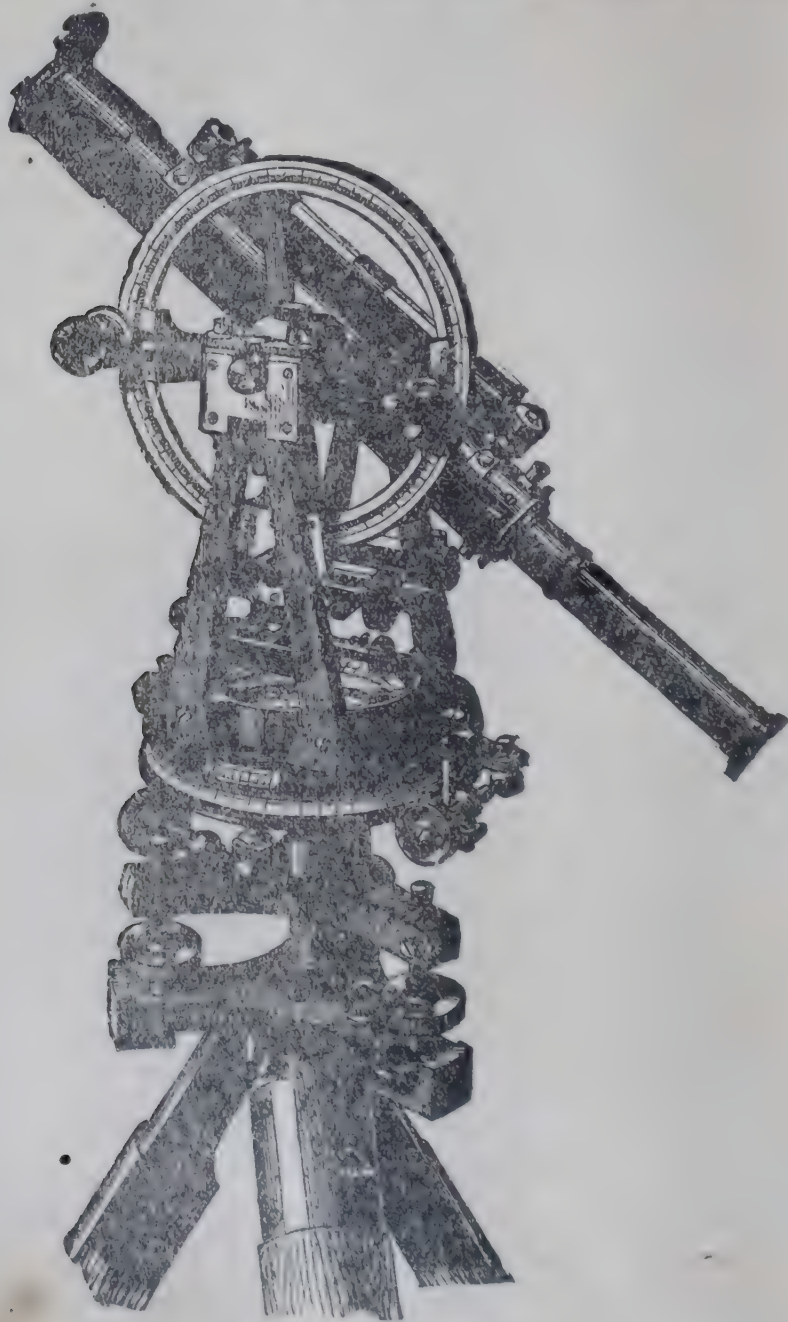


FIG. 12.—THEODOLITE.

of considerable length, and accurately measured. The theodolite is taken to A, and the angle between the base line and the line AC, which points to some distant object,

accurately measured. The theodolite is then taken to B and the angle CBA measured. From the length of the base line and the sizes of the two angles we can calculate exactly the lengths of the lines CA, CB. The theodolite is placed at B and then at C and the angles 3 and 4 are

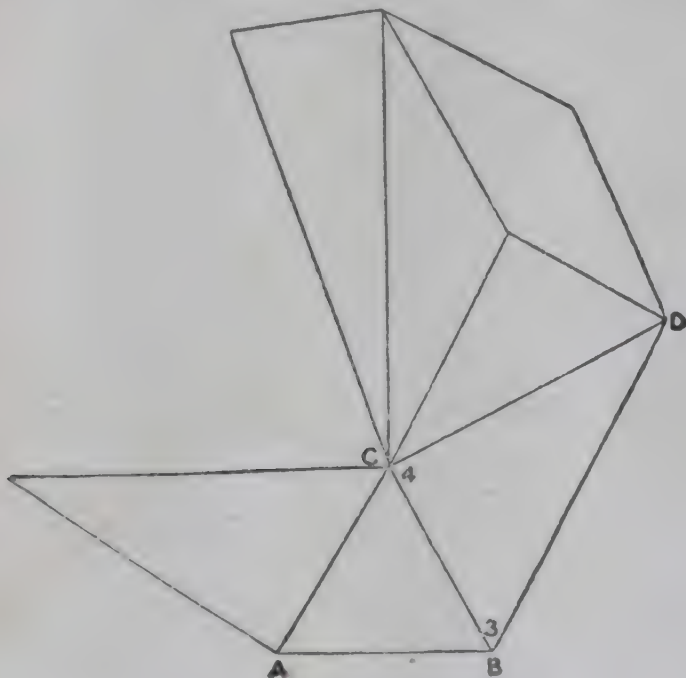


FIG. 13.—TRIANGULATION.

measured. In this manner the position of D is determined, and so on. The distances are found by the process of *triangulation*. The accuracy of the results depends in the first instance on the accuracy with which the length of the original *base line* is measured.

REVISION EXERCISES

1. A and B are two church spires 5,000 feet apart, B lying due east of A. From a third point C it is observed that A lies exactly north-west, and B north-north-east. Draw a rough plan showing approximately the relative positions of A, B, and C; and explain how, with the aid of a graduated rule and of a protractor for measuring angles, you would proceed to draw a plan accurately to scale. C. S., 1906.
2. In what districts in England are cotton, woollen, and iron manufactures carried on? O. S., 1888.
3. Draw a map of the Chinese Empire, showing six towns, six rivers, and six mountains of importance, and also the countries that border it. C. S., 1891.

4. How would you set about making a map of a zigzag road, given an ordinary or prismatic compass. L. J. S., 1904.

5. Plan out a field from the following notes.

Links.	
	To E
	1000
400 to D	600
300 to C	100
From A	100 to B

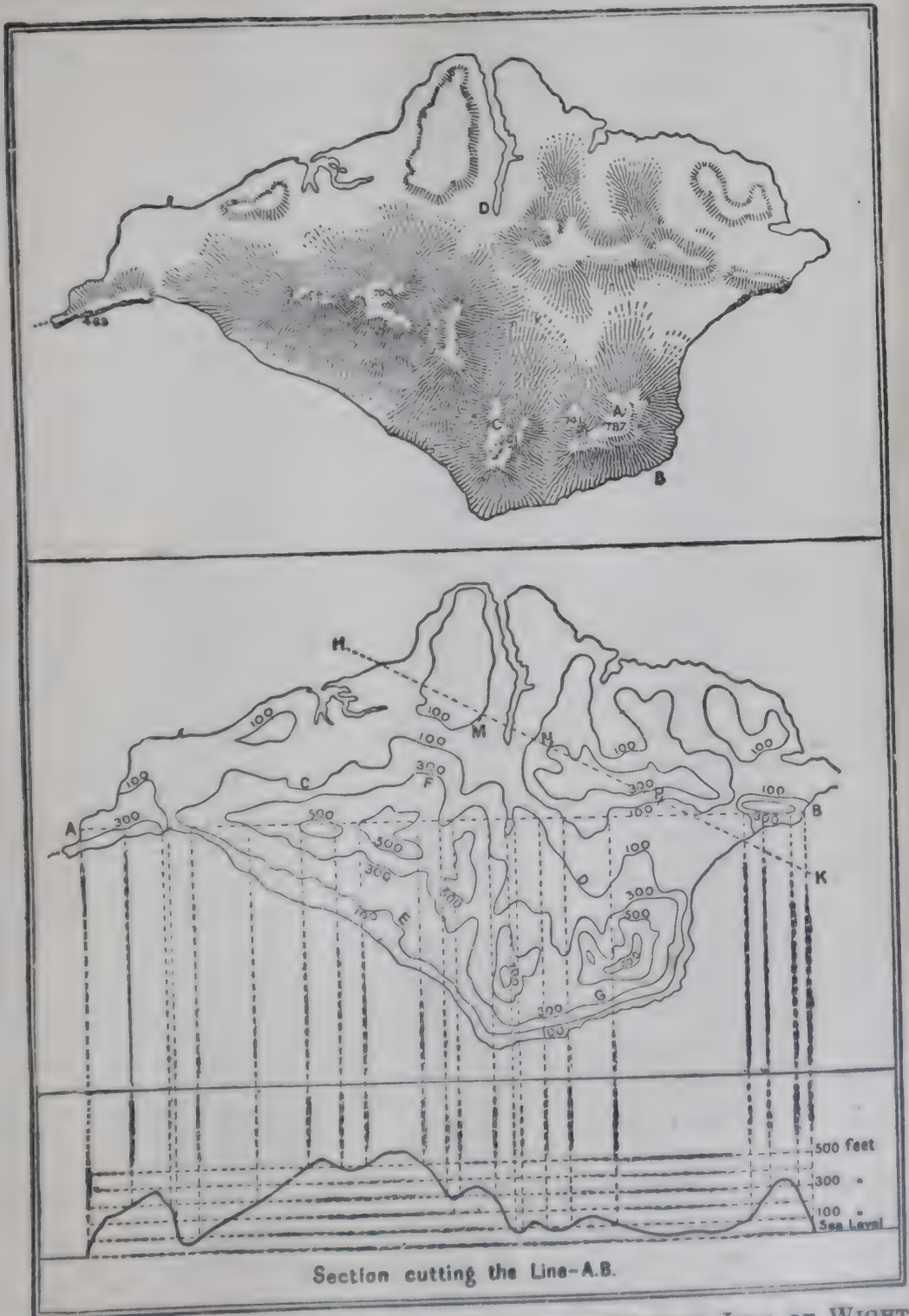
CHAPTER III

CONTOURS AND HACHURES

So far, the maps which we have drawn have given us the shape of various boundaries, the directions of certain roads, and the relative positions of a number of objects such as trees, ponds, houses and churches. But such maps do not show whether the ground is level or not. As a matter of fact, the ground is rarely level for any great distance. It rises and falls, sometimes forming gentle slopes, sometimes rising in rounded hills, or towering aloft in jagged and precipitous ranges. A map, to be of any great use to engineers and military men, must show, not only direction and distance, but also how the land rises and falls. This is done in several ways.

I. Hachuring is a system of shading. Where the land is steep, the shading is dark, and where the slope is gentle the shading is light. Flat portions, such as flat fields, and the tops of table-shaped mountains, are left white. The heights of the various points are printed on the map in figures.

Fig. 14 shows the Isle of Wight shaded in this way. Compare this with the map of the Isle of Wight given in

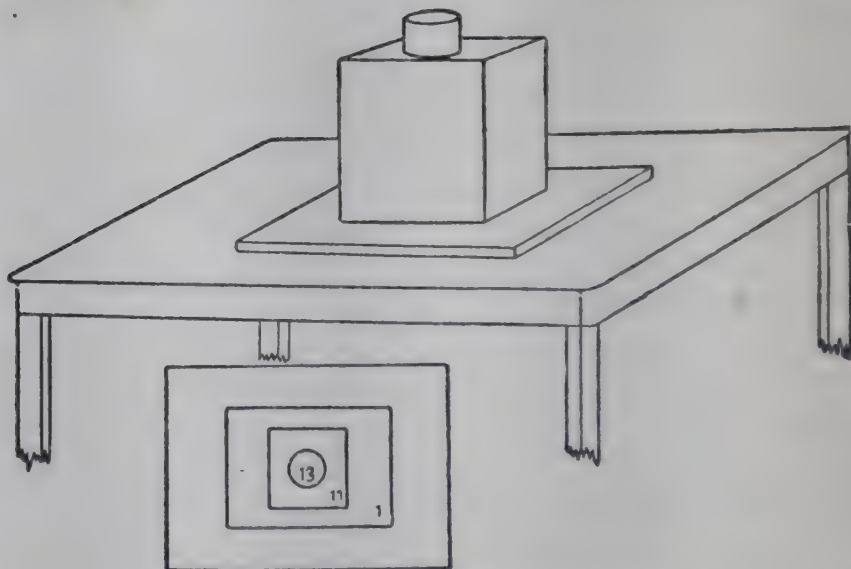


FIGS. 14 AND 15.—HACHURED AND CONTOURED MAP OF ISLE OF WIGHT.

your atlas and state where there are flat lands and whether they are high or low. Which coasts have steep cliffs? What kind of view would a person get from the point A if he looked towards B, C, and D respectively?

In the case of the hills at A and C, where are the steepest slopes?

II. Contour Lines.—Stand a small pill-box on a box of chalk, and this again on a drawing-board placed



FIGS. 16 AND 17.—CONTOUR LINES.

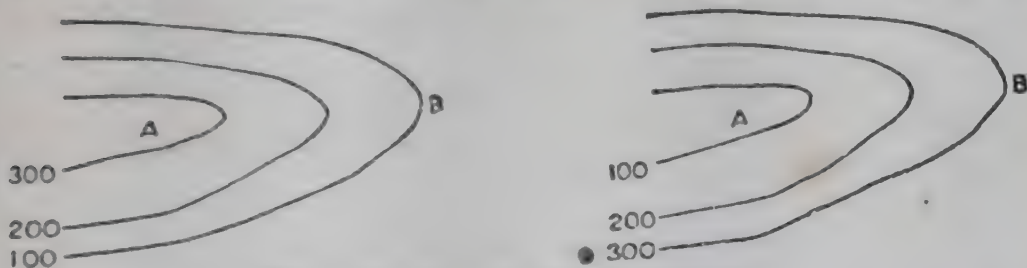
on a table. Let this represent a mountainous island, the top of the table being the sea. All the points on the drawing-board are 1 in. above sea-level. All the places on the top of the chalk-box are 11 in. above sea-level. All those on the top of the pill-box are 13 in. above sea-level. Imagine yourself looking down on the table. Fig. 16 shows the plan. On each line is written the height of that line above sea-level.

The lines connect all places at the same level above the sea. Such lines are called "contour lines." They show the outlines of the land at different heights.

In Fig. 15 we have a map of an island with contour lines drawn. All the places on the outer line are at the sea-level. C, D, and E, and all the places on that line, are

100 ft. above the sea-level, F and G are 300 ft. above sea-level, and so on.

Contour lines enable us at once to say what is the height of any given place on the map. They show the shape

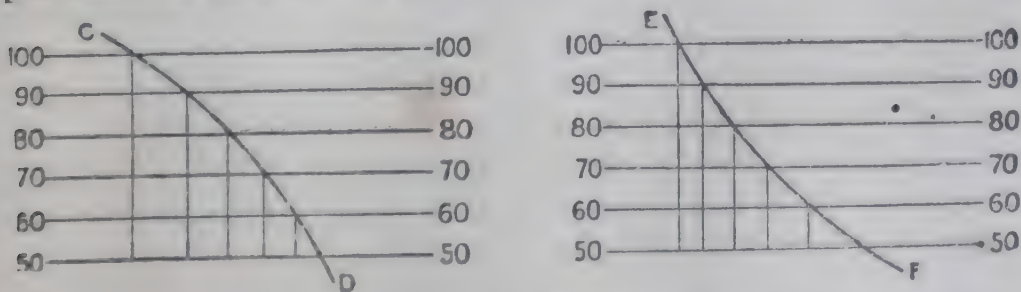


FIGS. 18 AND 19.—CONTOUR LINES.

of a hillside, whether it bends in or out. They also indicate whether the slopes are steep or gentle, and what is the exact degree of the slope. Wherever the contour lines are close together, the slope is a steep one; where they are far apart the slope is a gentle one.

Consider the Figs. 18 and 19. Notice that in the case of 18, if you built a model to show these heights they would represent a spur, but that in the case of (19) they would represent a valley. Deduce a general rule for determining whether the contours represent spurs or valleys.

Consider the Figs. 20 and 21 where we have two hills, one concave and one convex. By dropping perpendiculars from the points where the contour lines cut the hills to the horizontal line at the base, we can see that when the hill is convex (a) the distances between the feet of the perpendiculars decrease as the numbers on the contour lines



FIGS. 20 AND 21.—CONTOUR LINES.

decrease, but that when it is concave (b) the spaces between the feet of the perpendiculars increase as the numbers on the contour lines decrease.

III. The Layer System.—In the layer system different colours are used to show the way in which the land slopes, all land at the same level being of the same colour. This system is employed in many atlases. It is very effective, as it at once catches the eye. Bartholomew's Reduced Survey Maps, 2 miles to the inch, are coloured in this way. Get one of these maps showing your own county. Observe how the land rises and falls. Find the heights of the chief points in your county. If there are anywhere two roads connecting the same two places, find which one would give you the most free-wheeling on a bicycle. Observe how the rivers run, and connect their direction with the slope of the ground. In particular, follow out minutely (writing a description of) the course of the stream or river nearest to your school. How many feet does it fall in passing through the county?

There are several ways of determining heights and observing inequalities in the ground.

- 1. Barometric.**—The barometer measures the pressure of the air (see Part I. Chap. VI). In a mercury barometer this is given by the height of mercury supported by the pressure of the air. As you ascend a hill the pressure decreases and the mercury falls. It falls about $\frac{1}{8}$ in. for every 91 ft. of ascent. A mercury barometer is not a very convenient instrument to carry up and down a mountain, so another instrument called an **aneroid barometer** is used. In this instrument the air presses on a thin metal case, and a dial hand outside registers the pressure in inches.



FIG. 22.
ANEROID BAROMETER.

Fig. 23 is a contoured map. Mark on it the route with the smallest slope between the points A and B. At the spot C, which is 20 ft. above sea-level, the barometer stands at 30 in. At the same time the barometer at D stands at 29.8 in. Find the height of D above sea-level (C. J., 1903).

2. Thermometric.—When we heat water, some portion of it is turned into vapour. When the water is hot enough this vapour passes away rapidly, and the water makes a bubbling noise. At such a time the water is said to boil. Now, boiling only takes place when the tension of the aqueous vapour is equal to the pressure of the air upon the surface of the water. If you boil water at the sea-level, you will see that boiling occurs at about 212° F. At this temperature the aqueous vapour is strong enough to overcome the downward pressure of the air. Go up a hill until you have ascended 530 ft. Boil the water again.

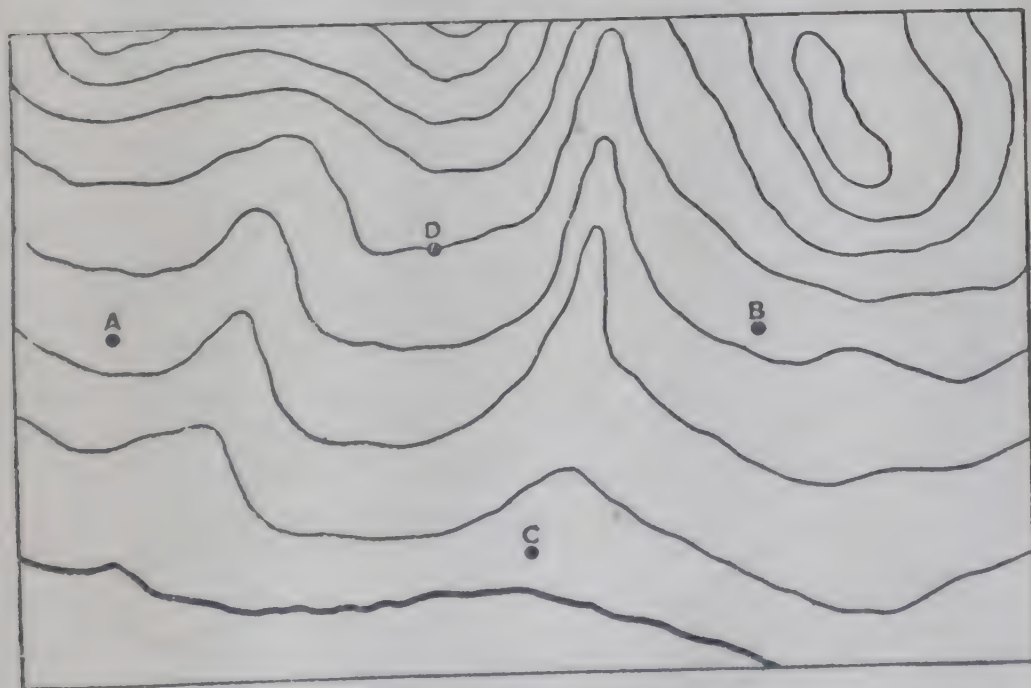


FIG. 23.—A CONTOURED MAP.

Its temperature now is about 211° F. In the highest parts of Himalayas the water would boil at about 180° F. For moderate heights the following rule gives fairly accurate results: *Find the temperature at which the water boils and subtract this from 212° . Multiply the difference by 530, and you have the height in feet.*

3. By Means of the Spirit Level.—The spirit level is used with a telescope. In the object glass of the telescope there are two thin threads crossing each other at right angles. The spirit level is used to set the telescope

horizontal. Imagine that you are measuring the levels along a road (Fig. 24). Place the telescope at A. An assistant carries a staff marked in inches to some point C, and then holds it upright. The observer looks through the telescope and sees at B a certain number, which gives the



FIG. 24.—MEASURING LEVELS.

height of the point B above the point C. Suppose that the telescope is 5 ft. above the ground.¹ Then if C were on the same level as the foot of the telescope, the number seen at B would be 60. But suppose that B shows 120 inches. Then C must be 60 inches below A. If the observer knows that at A he is 300 ft. above sea-level, then C is 295 ft. above sea-level. In this way a series of observations can be made, and a section of a road afterwards drawn. For some interesting contours of roads see the *Contour Read Book*. Choose preferably that section of the road book which deals with your own part of the country, and compare the contours there given with the roads as drawn on Bartholomew's Reduced Ordnance Map.

4. By Means of the Theodolite.—In your

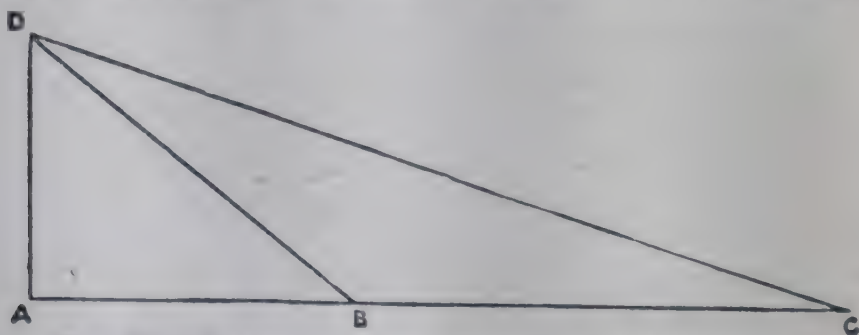


FIG. 25.—MEASURING THE HEIGHT OF A MOUNTAIN.

geography book, you will find the heights given of mountains which, like Mount Everest, have never been climbed. Their heights have been determined by means of a theo-

¹ (N.B.—The drawing is not to scale, and the figures are purely imaginary, and given merely to illustrate the method.)

dolite, in the following way. AD represents the mountain, and B and C two points where observations have been made. Set up the theodolite at C and read the angle DCA. Go to B. Measure CB and the angle DBA. Then draw a plan to scale, and measure the height of AD on the same scale. This gives the height of the mountain. When you have learned how to use a clinometer, try and find the height of the school chimney above the playground, etc.

A flagstaff is 60 ft. high. From where I stand, the angle of elevation of the top is 15° . How far am I from the staff? (From *A First Year's Course in Geometry and Physics*. Young.)

A man at sea sees a lighthouse on a rock. He is 120 yards from the foot of the rock. The angle of elevation of the foot of the tower at this place is 14° . He goes 120 yards further out to sea, and then he finds that the angle of elevation of the top of the tower is 14° . What is the height of the tower? (From *A First Year's Course in Geometry and Physics*. Young.)

5. **The Clinometer** is used for drawing contour-lines. Try to make a contour map of some part of your own district.¹

A simple clinometer consists of a protractor, graduated as shown in the figure, and a plumb line. Sight a distant object. If the object be on the same level as your eye the plumb-

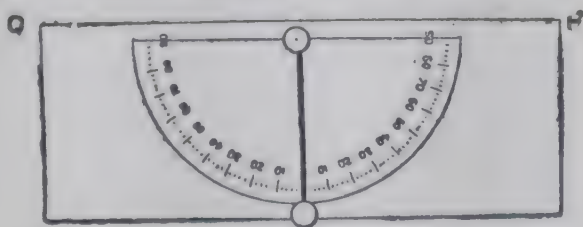


FIG. 26.—A CLINOMETER.

line will hang at 0° . If the object be above or below your eye, the plumb-line will indicate the angle of elevation or depression, as the case may be.

Suppose that BC (Fig. 27) represents the side of a hill sloping to C, and that the observer is at B. Suppose that contour lines are drawn through B and through C. Then AB is called the Vertical Interval between the two contours. It is written "V.I.," and is usually expressed in feet.

¹ The clinometer figured above is combined with a sight-rule. It is made by Harris of Birmingham.

If you find on a map a note, "Contours at 50 ft. V.I.," this means that any two successive contours are separated by a vertical interval of 50 ft. The distance AC is called the Horizontal Equivalent. It is written H.E., and is

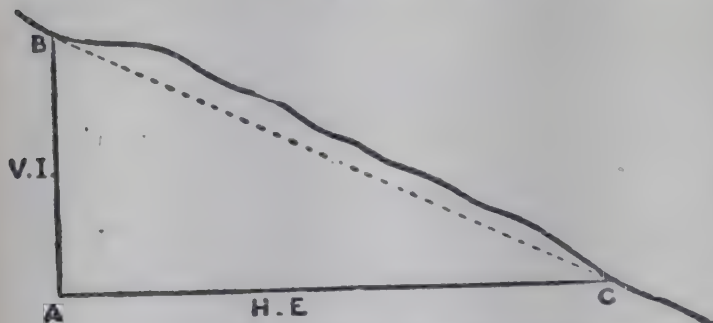


FIG. 27.—"V.I." AND "H.E."

usually expressed in yards. If you know both, you know the angle of the slope. On a hillside you can find, with the clinometer, the angle of the slope and the length

of the slope, but you cannot get inside the hill to measure either the vertical interval or the horizontal equivalent. For moderate slopes there is not much difference between the lengths BC and AC. By measuring from B to C you get practically the length AC, and so you could find AB. With every clinometer you are provided with a "Table of Horizontal Equivalents for 20 ft. Vertical Intervals." Such a table is given below for reference. The use of the table will be shown presently.

Degrees.	Yards.	Degrees.	Yards.
1	382	16	23
2	191	17	22
3	127	18	21
4.	95	19	19
5	76	20	18
6	63	21	17
7	54	22, 23	16
8	47	24	15
9	42	25, 26	14
10	38	27	13
11	34	28, 29	12
12	31	30	11
13	29		
14	27		
15	25		

To mark Contours on a Map.—Take a map drawn on a scale of 6 in. to the mile, and go to the top of the hill you have chosen. Select a convenient starting-point. By the aid of the clinometer, find another point on the same level as far away as you can. Pace the distance. (N.B. Before setting out make 100 paces. Measure the total distance

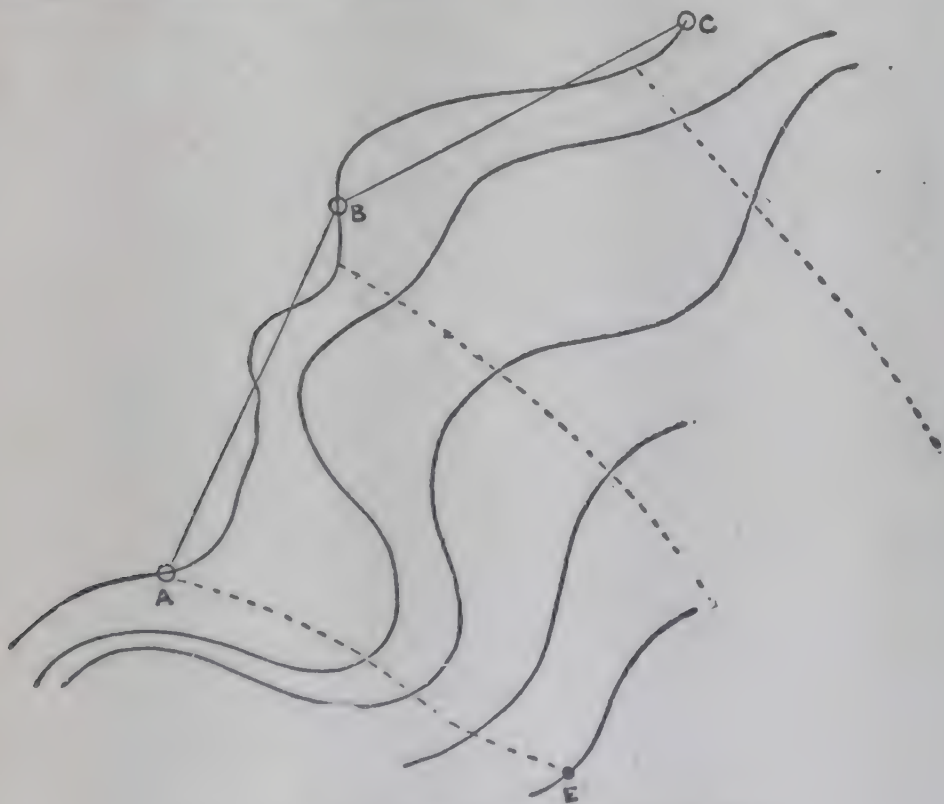


FIG. 28.—TO MARK CONTOURS ON A MAP.

paced, and so find the length of one of your paces. Do this several times, till you feel you have got a fairly accurate and constant result.) As you go towards B, sketch in the contour. If you go over a slight rise curve the line away from AB outwards from the hill. If you go down a slight hollow bend the curve inwards towards the hill. Judge all these small curves with the eye. When you get to B find a point C on the same level as B and traverse up to it in the way explained. Do this all round the hill, or else as far as you think necessary. In this way you draw the first contour line.

Now select some prominent object at E, and plot the

line you mean to follow from A to E. You can take its direction with a compass, but the map has usually enough detail on it to enable you to put in the line by eye. Such a line is called a **section line**. Observe the slope with the clinometer. Suppose that this is 18° . Look in the table of horizontal equivalents and you will see 21 yards opposite 18° . That means that if you walk 21 yards down the slope you will have descended a vertical interval of 20 ft. Pace 21 yards down the slope. Stop. Measure off 21 yards on your scale and put in another contour. Look down the slope again. Suppose this angle is 14° . The H.E. for this is 27 yards. Pace 27 yards. Stop. Measure off 27 yards on your scale and put in another contour. Go on in this way till you reach the bottom of the line.

Lay down another section line and mark contour points as before. Choose as few section lines as you can, consistent with reasonable accuracy. When there are several hills, walk along the watersheds. Every time you mark the position of a contour, face the hill, hold the map to correspond with the ground, and trace the contour to right and left by the eye, as far as you can see.

By adopting the above procedure you can draw contour lines at vertical intervals of 20 ft. But these do not give you the real height of any point. If you can find the height of one of the contour lines above sea-level with the aneroid barometer, you will then know the height of every place on the map. The level with reference to which heights are measured is called a **datum**, or **datum-line**, or **level**. You will find it most convenient to consider sea-level as the datum-line.

Take an orange and cut it down the middle. The part exposed by the cut shows the outline of the orange at that place. It is a section. When you have a contour map you can always make a drawing which will show what the country would look like if it were cut through, and one part removed so that the other could be seen.

The method of drawing a section is shown in Fig. 15, page 15. Underneath the contour map you have a scale of heights. The heights must be on a much larger scale than the scale

of the map, or they will be too small to be seen. Choose a convenient scale of heights, and number them 100, 300, etc., to correspond with the numbers on the contour lines. Choose a point on the map at the place where the line of section cuts the contour line 100. Drop a perpendicular from this point to the 100 foot line on the scale below. Follow the section line to the next contour line, 200. Drop a perpendicular to the 200 line on the scale below, and so on. Join the points as shown in the figure. If you wish to draw a section across HK, draw a horizontal line equal to HK, erect a scale of heights, and mark the positions of M, N, P, etc., on their appropriate lines.

Study a physical map in your atlas. You will find that a certain scheme of colouring has been adopted to give you the heights of the land and the depths of the water. Make a section across a certain part of the country. Draw a horizontal line on the same scale as the map. Choose a convenient scale for the heights, and rule the necessary lines. Draw on the map in your atlas a line connecting two places between which you wish to draw the section. Put a strip of paper along the line you have drawn on the map, and mark with pencil where each colour begins and ends. Transfer these marks to the datum-line, and then erect perpendiculars to represent the different heights. Join the points found.

In this way draw sections as follows: (1) Gibraltar to Berlin; (2) New York to San Francisco; (3) Quito to Rio de Janeiro; (4) Bombay to Madras; (5) Adelaide to Sydney; (6) Mouth of the Congo to the Mouth of the Zambesi.

REVISION EXERCISES

1. A hill, 1,000 feet high, slopes gradually into the sea at an angle of about 30° on its N.E. and S.E. sides. To the N.N.W. it is connected by a ridge 500 feet high at its lowest point with a conical peak 800 feet in height. To the W. it descends precipitately from the summit to a height of 600 feet; thence it falls with a more gradual slope of about 45° into a river, which runs S.E. under the smaller peak, due S. under the larger hill, and winds again to the S.E. round the base of the latter, to enter the sea. Express these relations by a map with contour lines at intervals of 200 feet vertical height. O. J., 1896.

2. What are the principal differences between the physical features of the East and West coasts of Scotland? C. P., 1903.

3. On a map of the monsoon region of Asia, mark the Nilgiri Hills,

Sumatra, the Kra Isthmus, Manilla; the rivers Godavari, Irawadi and Mekong; the towns Colombo, Singapore, Bangkok, and Batavia.

O. J., 1906.

4. In the space below the map (Fig. 29) draw the section from A to B and state what the map represents.

C. J., 1905.

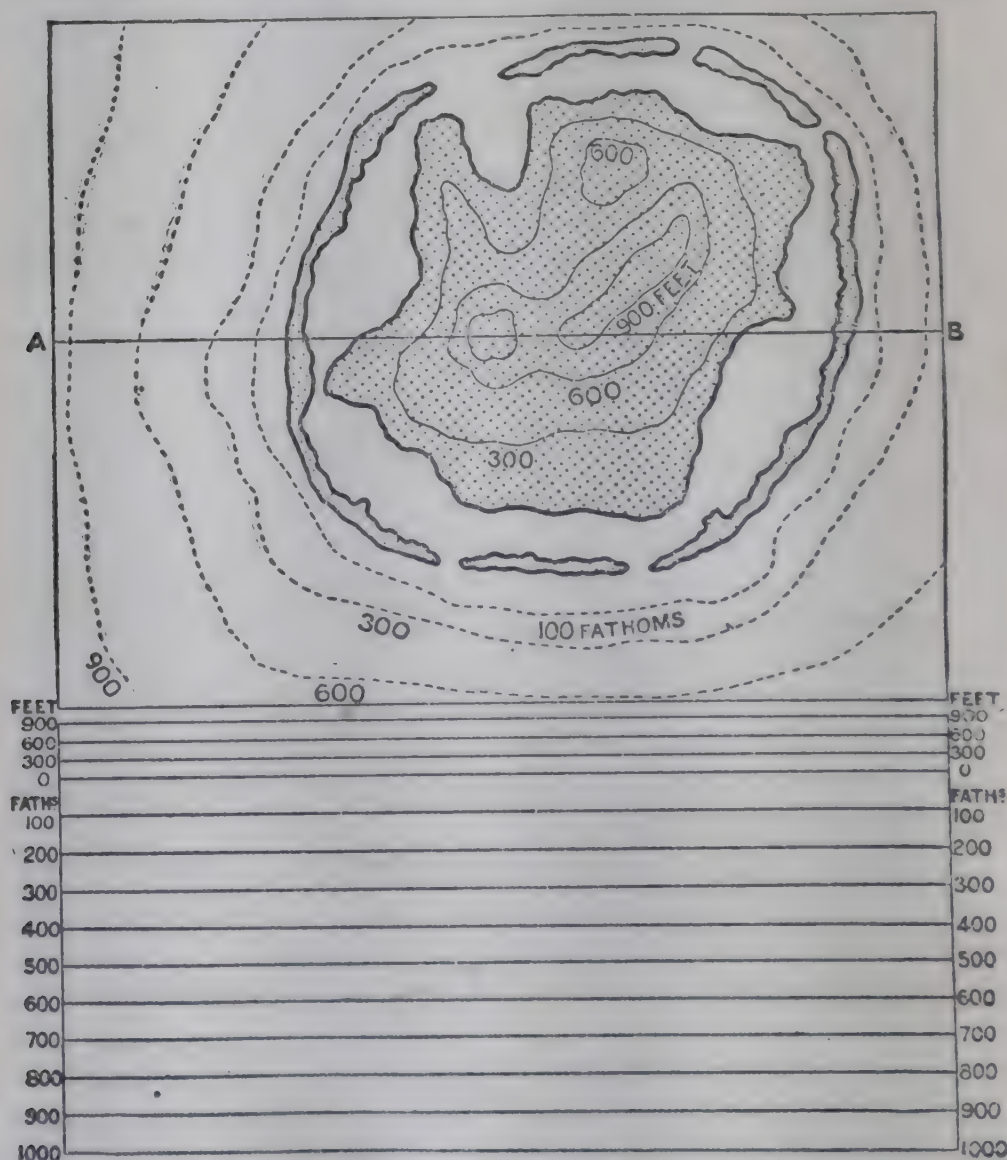


FIG. 29.—CHAPTER III. EXERCISE 4.

5. A ridge, 400 feet high, connects a broad topped hill, whose height is 600 feet, with a conical peak 700 feet high, situated to the S.E. of the hill. The hill is indented on its W. side by a steep ravine, but its other sides are of gentle declivity. The side of the peak which faces the hill is of more gradual slope than its other sides, which are steep, the S.E. side being precipitous.

Express these relations by means of a map with contour lines making intervals of 100 feet vertical height.

O. J., 1898.

CHAPTER IV

ORDNANCE MAPS

THE British Government publishes Ordnance Maps on scales of 1 inch to the mile, 6 inches to the mile, and 25 inches to the mile. City and town maps are published on scales of 5 feet to a mile and 10 feet to a mile. All Ordnance Maps are printed with the north at the top of the map. These

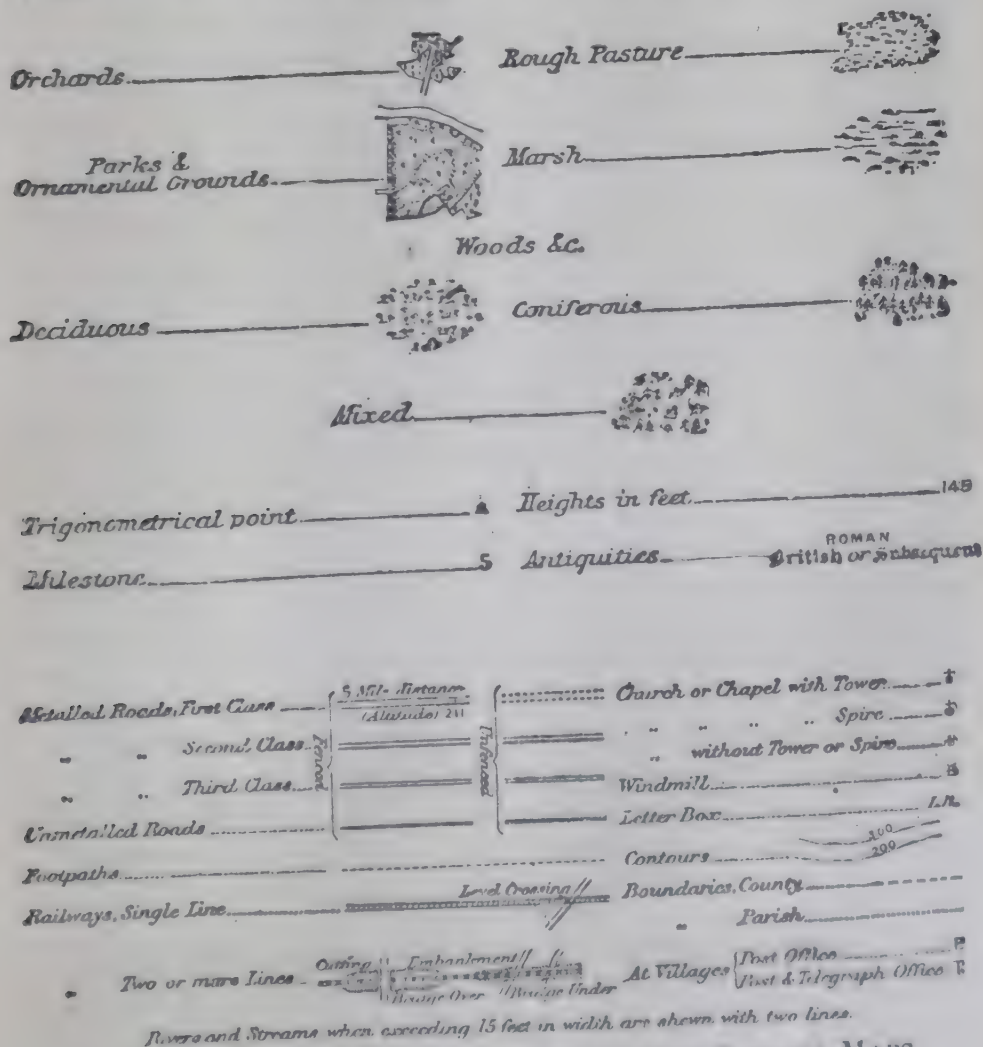


FIG. 30.—SYMBOLS AS USED ON ORDNANCE SURVEY MAPS.

maps contain a number of signs as shown above, and by comparing this figure (Fig. 30) with an Ordnance Map,

preferably that of the district round your own school, you can learn a great deal about a district that you have never seen or read about.

THE 6-INCH MAP

Provide yourself with a 6-in. map showing the district round your own school for about a mile in each direction. Answer the following questions on it. If the questions cannot be exactly answered from the map, they may be neglected.

How do you reach the main road from your school? Where does the main road lead? Which is the nearest railway to the school? In which direction does it run? Has it any bridges, and, if so, are they under or over the line? Is the railway single or double? Are there any tunnels, cuttings, or embankments? Can trucks be shunted off the main line at the station? How do you get from the station to any particular spot? Coming from the nearest large town to your own, on which side of the line do you alight? Give simple directions to a stranger so that he may find his way: (a) by day, (b) by night, from any point A to another point B. By means of a piece of thread, measure the distances from the school to any six important places. If there is a river, measure its width at certain fixed points. Which way does the river flow? Give the heights of six important places, including your own school, above sea-level. Name all the places of worship. Name any castles, ruins, or other objects of historic interest. Are there any woods? If so, what kinds of woods are they? Are there any marshes? Put a ring round each of the milestones. What is the area of the map?

THE 1-INCH MAP

Get a map showing the district about 10 miles round your own town. Give the directions of 10 important places with reference to your own town. Name the rivers, and say in what directions they flow. Choose any six places, and say what kinds of roads connect them with your school. Choose any other six places, and give their

heights above sea-level. Find the contour lines. At what intervals are they drawn? What is the difference in feet between the highest and lowest points on the map. Trace a portion of the map on tracing paper and colour the spaces between the contour lines. On this map insert the rivers, railways, a few main roads, and ten or twelve important places.

Name the railways. In what directions do they run? How many bridges, tunnels, cuttings, embankments, has each line? Find three places where the churches are not the same in appearance, and state what are the differences. Give four places from which you cannot send a telegram. Find the distances in a straight line between your town and six other places. Name the best cycling routes between your school and these places. What is the area of the map?

Draw an imaginary picture of what you could see from some chosen spot.

On a piece of tracing paper, map out a walk, as described by your teacher. Write a description of this walk in such a way that a stranger could follow the same route without missing his way. Measure the length of the walk with a piece of thread.

REVISION EXERCISES

1. Draw a sketch showing a piece of main road which crosses a meadow (road unfenced on both sides), then passes over a stream by means of a bridge, next goes through a wood (where both sides are fenced), and on coming out of the wood passes under a railway bridge. The railway crosses the road at right angles on an embankment. N.B. Use the conventional signs employed in the maps of the Ordnance Survey.

O. J., 1906.

2. Give a geographical account of Ulster, describing its physical features and climate, and naming its chief industries and towns. C. S., 1906.

3. Make a sketch map of India, showing its chief mountain-chains and river systems; mark also the great ports and the positions of the chief native states.

O. S., 1894.

4. In cycling through the village of X, I ask my way to the village of Y. I get the following directions:—"Go down the village street for about a quarter of a mile till you come to the church, which is on your left hand; then turn sharp to the right, and cross the bridge over the railway; turn to the left, and then follow the road running alongside the railway for two miles, till you come to four cross roads in a wood, just after crossing a bridge over a stream. Turn to the right, and keep to the road beside the stream for a mile: you will see the village of

close on your right. Draw a rough sketch map which would help me to remember these directions. O. P., 1906.

5. Draw an outline sketch of the country delineated in Fig. 31.

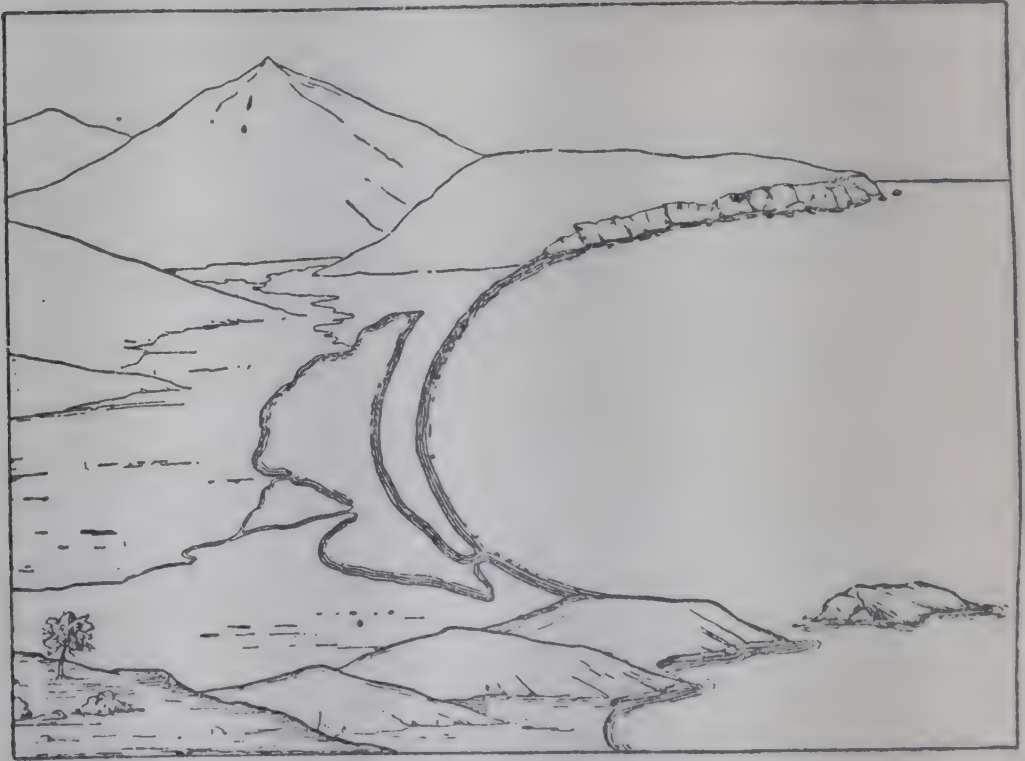


FIG. 31.—CHAPTER IV, EXERCISE 5.

Write numbers on the map to indicate the physical features, and write the names of these physical features opposite corresponding numbers in the space below. C. J., 1906.

CHAPTER V

PROJECTIONS

CHOOSE some small portion of the surface of a globe. Imagine that you could cut this little piece out and press it flat upon a piece of paper. The flattened piece would be so much like the curved piece that very little distortion of shape would be produced. But consider a large area, such as the continent of Asia. If you attempt to flatten that out in the way suggested above, you will see at once that

the flat map will not represent the curved one. The shape of the continent will be distorted. Again, suppose that you could stand outside the earth and produce a flat map by photography. You would get, in one given position, a view like that shown in Fig. 32. Now ABC represents approximately half the circumference of the earth, measured along the equator and ADC represents approximately half the circumference of the earth as measured along a great circle through the poles. These two lines, on the earth's surface, are very nearly equal. But in the photograph, one is much longer than the other. Therefore, in a flat map, not only is the shape of a large area somewhat incorrect, but the distances also are not correct.



FIG. 32.—WORLD IN SPACE.

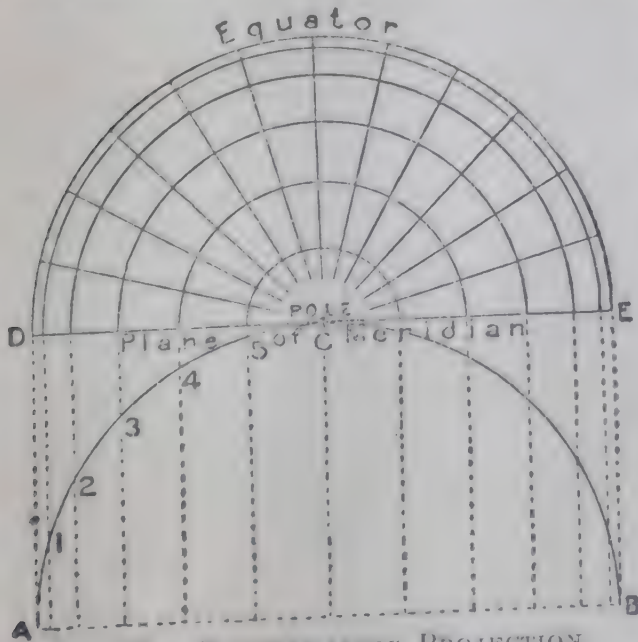


FIG. 33 — ORTHOGRAPHIC PROJECTION.

A number of methods have been adopted for drawing flat maps. They are all incorrect in some point, as only a curved map can properly represent a curved surface. The method adopted for making a map depends partly on the purpose for which the map is required.

Orthographic Projection.

Suppose that ACB represents a portion of the earth's surface, and that the

points 1, 2, 3, etc., are all equally distant from each other. Imagine that DE represents a flat surface on which

the map is to be drawn. Drop perpendiculars from 1, 2, 3, etc., to the line DE. Notice that in the centre the

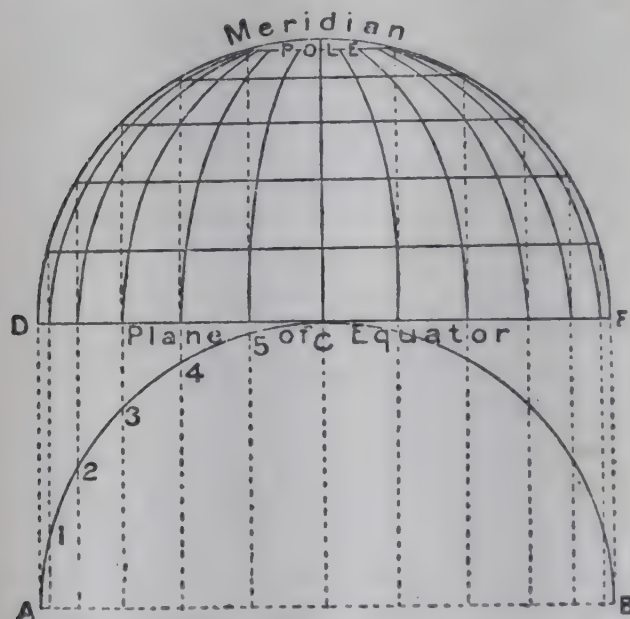


FIG. 34.—ORTHOGRAPHIC PROJECTION.

distances of the points from one another are fairly uniform, but that as you get towards the ends of the line they become too near together. This projection is called the **orthographic projection**. It is not much used, except for maps of the moon and for maps of the polar regions. From a point above the poles, the meridians appear as straight lines, and the parallels of latitude as a series of concentric circles (Figs. 33 and 34).

Stereographic Projection.—Suppose that ABH represents the globe, that your eye is at A, and that you can see right through the sphere. Let NP be the flat surface on which the map is to be drawn. Choose a number of points equally distant from each other, e.g. E, F, G, etc., and from

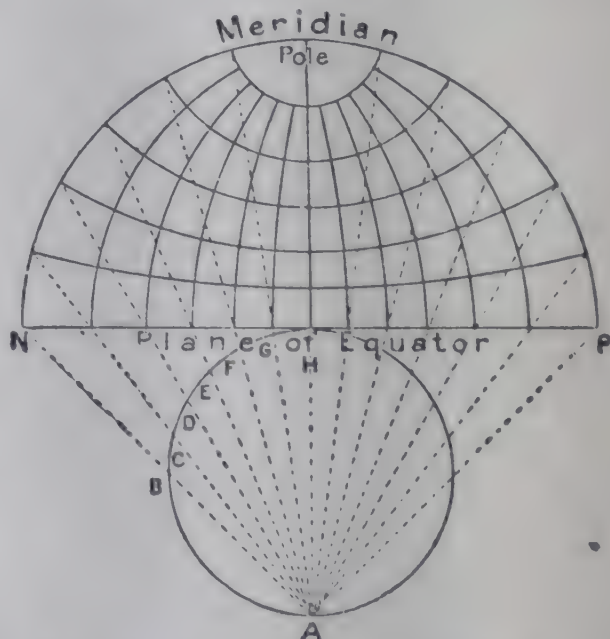


FIG. 35.—STEREOGRAPHIC PROJECTION.

A draw a series of lines through each of these points to the line NP. You will see that the points near the

middle are rather too close together, while the points near the ends are separated too widely. But the distances do not increase so rapidly towards the edges as to render the map useless. All circles on the globe are represented by arcs of circles on the map, and lines cutting one another on the globe cut one another at the same angles on the map. The distortion of parts of the map near the edges is not great. The **Stereographic Projection** is used for making maps of the hemispheres.

Equal-area Projection or Equivalent Projection is a modification of the Stereographic; each area contained between any lines of latitude and longitude being equal (according to the scale) to the areas contained by the same lines on the earth's surface. The shapes of the countries and their relative positions are on this system very incorrect.

Conical Projection.—This method is used for making a map of a small part of the earth's surface, say a map of Europe. A hollow cone is placed over a globe,



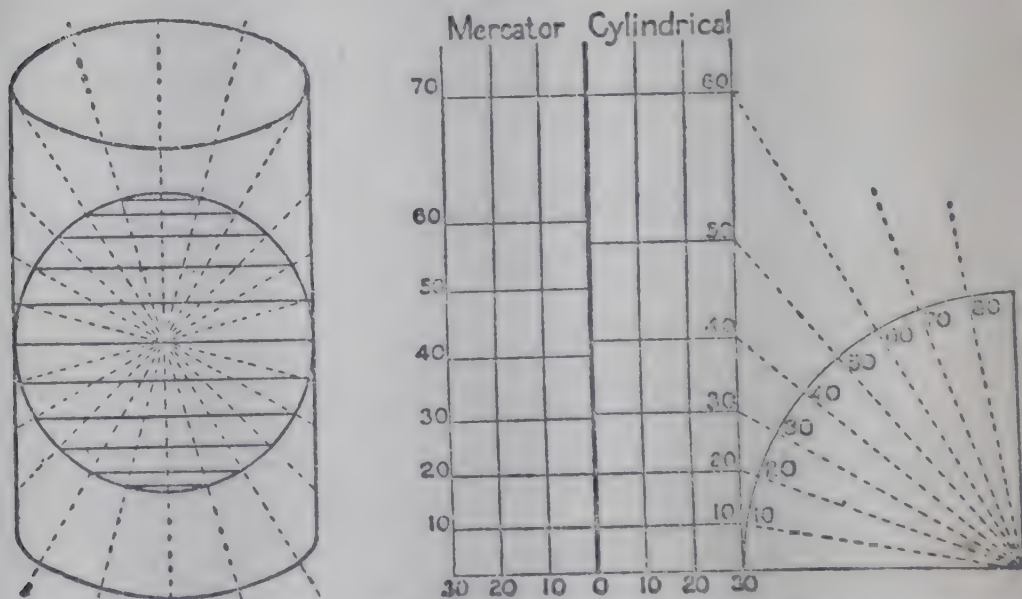
FIG. 36.—CONICAL PROJECTION.

so that it just touches the central parallel of the country of which the map is required. Imagine that lines are drawn from the centre of the sphere through various points on the globe to meet the internal surface of the cone. The projection of the pole falls at the apex of the cone. The parallels of latitude are projected as circles, and all the meridians are projected as straight lines running to the pole. Unfold the cone and spread it out on a flat surface. Except near the apex of the cone, the map is only very slightly distorted. Generally, this system should not be used for areas extending over 30° of latitude.

Cylindrical Projection.—None of the maps drawn

on the projections described above are of much use to a sailor. He does not care much about the shape of the country on the map. He wants to know the exact positions of the points with reference to one another.

Imagine that the globe is in a cylinder, and that lines are drawn from the centre of the globe so as to project the points on the surface of the globe upon the internal surface of the cylinder. Cut the cylinder open and roll it out flat. There is no pole on such a map, for its projection does not fall on the surface of the cylinder. The distance between the parallels is exaggerated, and the meridians, instead of



FIGS. 37 AND 38.—MERCATOR AND CYLINDRICAL PROJECTION.

meeting at a point, are parallel straight lines, at equal distances from each other.

Mercator's Projection is a modification of the cylindrical method. As the meridians do not meet at the poles, the balance is to some extent restored by opening out the parallels of latitude towards the north and south. The relative sizes of areas on maps drawn on this projection are incorrect. Greenland looks larger than Africa. The shapes are, however, more correct than when the map is drawn on the cylindrical method of projection. The true relative positions of places are maintained, and this is

the distinguishing feature of the map, and the one that makes it so suitable for sailors. A navigator has only to draw a straight line on his chart from port to port to know what course he has to steer.

In making maps of the world, or of continents, the stereographic projection is used. For a map of the Polar Regions, the orthographic is suitable, but the stereographic is preferable. For a country very near the equator, the cylindrical is suitable. For maps of ordinary countries the conical is the best, while for mariners' charts Mercator's Projection is adopted.

Look in your atlas and see if you can find on what projections the following maps are drawn: the World, the Eastern Hemisphere, the Polar Regions, Russia, Switzerland, the British Isles, Japan, Africa, Australia, Oceania.

REVISION EXERCISES

1. What are the special advantages and disadvantages of a map on an "equal-area" projection? Mention any purposes for which you would prefer to use such a map. O. S., 1906.

2. What industries are characteristic of the following districts respectively—Cheshire, Clackmannanshire, Cornwall, Durham, South Lancashire, Lincolnshire, Monmouthshire, Renfrewshire, Worcestershire? C. S., 1897.

3. Draw a sketch map showing the river system of India. O. S., 1891.

4. Draw parallels of latitude and meridians for a map of the eastern hemisphere on the stereographic projection, the plane of projection passing through the meridian of Greenwich. Only the following parallels and meridians need be shown:—the equator, and parallels of latitude for 45° N. and 45° S.; meridians for 45° E., 90° E., and 135° E. C. S., 1905.

5. A moor having a broad circular top, 1,400 feet high, descends gradually to the plain on its N. and W. sides, but on its E. and S. sides is indented by the valleys of two streams which rise on the moor above. The eastern valley runs E.S.E., and the valley on the S. side of the moor runs due S. Three spurs of the moor bound the two valleys. The eastern spur is 1,200 feet high, the south-eastern spur 1,000 feet, and the southern spur 800 feet high. The terminal slopes of the spurs are gradual, but the sides which border the valleys are very steep.

Shortly below the level of 200 feet the eastern stream bends round to the S.W. and joins the southern stream to form a river flowing W. Express these relations by a map with contour lines making intervals of 200 feet vertical height. O. S., 1898.

CHAPTER VI

ROCKS

SCATTERED through the other parts of this book there are a number of observations as to the character of the crust of the earth, and the effects which have been produced by the action of rain, snow and ice. We propose in the next few chapters to gather together many of these facts, and to add to them others which could be profitably delayed to a later stage.¹

The crust of the earth is made up chiefly of two great classes of rocks, **Igneous** and **Sedimentary**. Many years ago this world was a molten ball. As it cooled, it hardened and the rocks which were then formed are called **Igneous** rocks, i.e., rocks formed by the action of fire. They include such rocks as the **granite** of Aberdeen and Cornwall, the **basalt** which forms the crags on which Edinburgh and Stirling stand, and the **lava**, of which we shall say more in the next chapter. These different rocks are not all of the same age. Some of them are extremely ancient. They all, however, contain silica, but in different proportions. Those that solidified at great depths are coarsely crystalline, while those that cooled rapidly near the surface are fine grained, and, in some cases, quite glassy. Granite is one of the rocks that cooled at a great depth. If you examine a piece of granite with a pocket-lens you will discover several minerals in it. One of these is quartz. It is glassy in appearance and breaks irregularly. Another is felspar. This is white or pink, has smooth faces, and cannot be scratched with a knife. A third is mica, which can be split into little plates with a knife. Mica is used in Russia instead of glass for lanterns and stoves.

Stratified Rocks.—On the top of the igneous rocks lay the stratified rocks, which, as their name indicates, were arranged in layers or strata. These beds can often be seen in

¹ You should read at this stage, *This World of Ours*, Foster, and *Elementary Physical Geography*, Geikie.

quarries and railway cuttings. They are arranged in three classes according to the way in which they have been formed.

i. Sedimentary rocks.

ii. Chemically formed rocks.

iii. Organically formed rocks, i.e., rocks formed from the remains of animals and plants.

Sedimentary rocks consist of the sediment which fell to the bottom of either running or standing water and which afterwards hardened. Wherever they are found, above the surface, they are a proof that that part of the earth was once under water, but has since been raised. They are not so old as the igneous rocks, for they lie upon them. **Conglomerate** (gravel, shingle, etc.), is sometimes called "pudding stone." It is a mass of rounded pebbles of various rocks, embedded in a kind of mineral paste. The pebbles have been rounded by running water, and the material which holds them together has been deposited amongst them by the water. **Sandstone** is composed of little round pieces of quartz worn from the rocks and cemented together. These rocks are porous and allow water to percolate through them. Sandstone is found in England in the Central Plain, in the Black Mountains of South Wales, and in some of the moorlands of Yorkshire and Derbyshire. **Clay** is a finer deposit than sandstone. It is composed of the fine mud derived from the wearing away of other rocks. The purest form of clay is **Kaolin**, which is used for making porcelain. Other varieties are fire clay, brick clay, and pipe clay. Clay contains a great deal of water. If the clay be heated, this water is driven off, and the clay becomes hard. It ceases at the same time to be plastic, as it is in the natural state. Clay extends across England in a series of belts, (a) One runs from the foot of the Cotswolds, through Dorset, Gloucestershire, Northamptonshire, Leicestershire, and Lincolnshire. (b) Another runs through Wiltshire, Oxfordshire, Buckinghamshire and Huntingdonshire. (c) a third is found in the lower parts round London, where it is known as the London Clay. **Shale** is a clay, which splits into thin layers. Under great pressure it forms **slate**. Clay, shale, and slate, differ from one another almost entirely in their relative hardness. **Boulder clay** is stiff, sandy, full of

stones, and large blocks or boulders. It was formed by ice when the land was covered with glaciers.

II. Organically formed rocks. The materials of which organically formed rocks are composed were once held in solution in the water. Various animals and plants abstracted these substances to build up their shells and other hard parts. When they died, these hard parts sank to the bottom of the ocean and formed deposits which have since hardened into rocks. Coal is an exception to this as it is formed mainly of vegetable matter. Limestone is a calcareous rock (Lat. *calcar*, lime), which is widely distributed. It is pervious to water, partly soluble in water, and quite soluble in acids. There is a belt of limestone stretching across England from Dorset to Lincolnshire. This belt is steep towards the first of the clay belts mentioned above, but slopes gently towards the second. It is called Oolite, or roe-stone, because it is composed of little round grains, like the roe of a fish. There is hard dark limestone in the mountains of Wales and Cumberland, and in the Pennines and the Mendips. The limestone of Salisbury Plain, and the North and South Downs is softer and whiter and is called **chalk**. Chalk is composed of the tiny shells of minute creatures called foraminiferae, which are, at the present time, busy forming one of the oozes on the bed of the Atlantic Ocean (see Part II., Chap. VIII).

Coral rock is a kind of limestone. It is formed by a creature called the coral-polyp. These creatures are sometimes called coral "insects," but the name is incorrect, as there are no insects in the sea. The coral-polyps build up a chalky skeleton from the chalk, which is dissolved in seawater. Some of the polyps live independently. Others bud out from each other and form a colony. These colonies are not usually found at a greater depth than 15 fathoms. They are found in the Pacific and Atlantic Oceans between latitudes 28° N. and 28° S. The West Indies and the Bermudas are either entirely, or in part, coral islands. Sometimes the animals build on a shelving coast and form a fringing reef. They build upwards till they reach the surface. Then those on the land side, being shut off from a plentiful supply of food, die. The sea dissolves a part of the

reef away and leaves a channel, between the reef and the shore. In this way we get a barrier-reef. In certain parts of the ocean there are coral islands enclosing a central lake or lagoon. These are called **atolls**. Since the coral polyp cannot live more than 90 ft. below the surface, it is probable that these coral islands are built on submerged peaks. As fast as the peaks sank, the animals built up to the surface again. Corals can only flourish in clear water. If a river enters the sea opposite a reef, and brings mud with it, there is always a gap in the reef at that point.

Carbonaceous rocks are also organically formed. **Peat** is caused by the alteration of vegetable tissue. In Ireland peat is plentiful. Here, in the damp lands, the bog moss flourishes. As it decays away in the lower portions it continues to grow upwards, and thus in time a thick mass of dead tissue is formed. At the bottom it is fairly hard and something like a very soft coal. There are probably 72,000,000,000 tons of peat in the British Isles. **Coal** is brittle and burns easily. It is formed of fossilized plants. In ordinary coal this is not easily seen as the plant forms have been crushed together. But the remains of great trees can often be found in the beds of clay or sandstone that lie between the beds of coal. Coal which has been so compressed that nearly all the gases have been expelled, leaving nearly pure carbon, is called **anthracite**. It burns with little flame or smoke, but with great heat and so is specially suited for use as a fuel in steam-ships. Much of the world's supply of anthracite is obtained from South Wales.

III. Chemically formed rocks. These include flint, rock-salt, gypsum, and dolomite or magnesian limestone.

We have seen that the rocks were laid down in horizontal strata. But they are not often found to-day in a horizontal position. If you look at them in quarries, railway cuttings, or exposed cliffs by the sea-shore you will find them tilted and crumpled. This tilting or crumpling is caused by the movements of the earth's crust. The crust of the earth is always moving. There are several forces at work, which are constantly causing a re-arrangement of the strata.

(a) **Elevation**.—The raising up of the earth's surface above its original level is still going on in this country.

Parts of Sussex have been raised to a considerable extent. Find Winchelsea. This town was once on the sea-coast, but as the land has risen, the sea has receded and the town is now inland. On many parts of the coasts of Scotland there are **raised sea beaches**. In places there are four or five terraces, one above the other, and if these be examined they are found to contain deposits of marine shells. In parts of Scandinavia, these marine deposits have been found at a height of 300 feet. It has been calculated that the centre of Norway and Sweden is being raised at the rate of about three feet in one hundred years.

On the coast of Kintyre, old sea caves have been found at heights of from 10 to 30 ft. above the present sea-level, while in Norway they have been found at a height of 200 feet above the present sea-level.

(b) **Depression**.—From Kent to Yarmouth the coast has sunk. At Dovercourt, in Essex, the remains of a forest are visible under the sea. Some people think that the fjords of Norway were hollowed out by glaciers; but it is more probable that they were formed by rivers and that then the land sank, and the valleys were filled with sea-water and converted into fjords.

(c) **Compression**.—If the land were merely elevated



FIG. 39.—COMPRESSED CARDBOARD.

or depressed the strata would remain horizontal. But they are sometimes inclined and sometimes crumpled. If you take a few long strips of cardboard and press them at both ends you can make them bend in one or other of the shapes shown in the diagrams (Fig. 39). So in the same way the strata have been compressed at the ends and bent and crumpled up in the way we often find them.

When a bed comes to the surface, the line along which it

appears is called the **outcrop**. The line may be straight, curved or indented. Its direction depends on the surface of the country and the position of the beds. The slant of the bed is called the **dip**. The direction of the dip is given by the compass. The angle between the horizon and the line of the dip is called the amount of the dip. It can be measured by the clinometer. It is occasionally as great

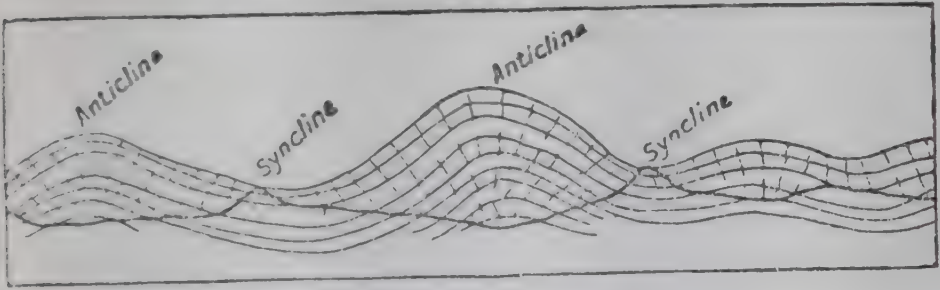


FIG. 40.—ANTICLINE AND SYNCLINE.

as 90° and often greater than 40° . The direction in which the outcrop runs is called the **strike** and is always at right angles to the dip. Thus the Oxford clay crops out in Wiltshire and Oxfordshire and Buckingham, and strikes S.W. and N.E.

But the beds are not merely tipped up at various angles.

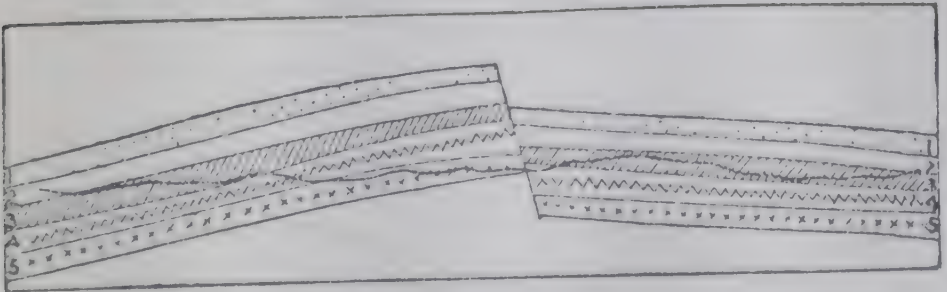


FIG. 41.—A FAULT.

Sometimes they get bent or folded. For instance, the chalk in the Chiltern Hills dips down underneath London and comes up again in the North Downs. Such a downward curve is called a **syncline** or **trough**. Sometimes the curve is in the opposite direction. It is then called an **anticline** or **arch**. Sometimes the rocks were very rigid and would not bend. They were therefore, fractured and displaced. Such a fracture is called a **fault**.

REVISION EXERCISES

1. Suppose you are going to walk to a railway station ten miles away across a stretch of open country where there are no roads or fences. You have a compass and an ordnance map of the district, on which you can recognize the point from which you start.

Describe how you would use the map to find your way. O. P., 1907.

2. What are the chief differences between the climate of a place in the tropics and that of one in the British Isles? Account as far as you can for the differences you mention. O. P., 1907.

3. On a map of Asia, insert the Himalayas, the Hindu Kush, the Urals, the names of the capes at the south of India, and the Malay Peninsula; the Yang-tse-Kiang, the Indus, the Obi; the Yellow Sea, Red Sea, Desert of Gobi, Kamtchatka, Straits of Bab-el-Mandeb, Bombay, Hong Kong, Peking, Aden, Tokio. O. J., 1897.

4. Taking advantage of the ebb-tide, we make our way through the pack-ice. We were obliged to push a good way into the fjord, where on all sides glaciers thrust their precipitous walls of ice into the sea. Several times it happened that huge blocks, from glaciers and icebergs, fell into the water, not far from us. We encamped for the night on a small islet, in lat. $63^{\circ} 20' N.$, long. $41^{\circ} W.$

Explain the meaning of the words and figures printed in black type.

O. P., 1907.

5. If you were given a contoured map on which the summits of two hills were marked A and B, and were asked to draw a section along the straight line joining AB, how would you set about it? What is the use of a section of this kind? O. J., 1907.

CHAPTER VII

VOLCANOES AND EARTHQUAKES

THE rocks are lifted slowly by movements that last for ages. From time to time, however, volcanoes and earthquakes cause rapid and startling alterations in the arrangements of parts of the earth's crust.

A volcano is sometimes called a "burning mountain," a term which is quite incorrect, as there is often no burning in a volcano, and again a volcano need not be a mountain. A volcano is merely a hole in the earth's crust through which steam, lava, and ashes are ejected. As the ashes are thrown out, they pile themselves into a conical mass. This consists of layers of ashes, lava, etc., arranged alternately. When this mass cools it contracts and great cracks occur. When the volcano ejects fresh material, this is sometimes forced

out through one of these cracks. When the lava cools in the cracks it solidifies into a number of veins of solid stone called **dykes**. The huge cup-like hollow through which the lava and ashes are thrown is called the **crater**.

Volcanoes may be classed as :

i. Active (a) Constant, like Stromboli ; (b) Periodic, like Vesuvius.

ii. Dormant.

iii. Extinct as in the Auvergne Mountains.

When a volcano emits nothing but vapour it is called a

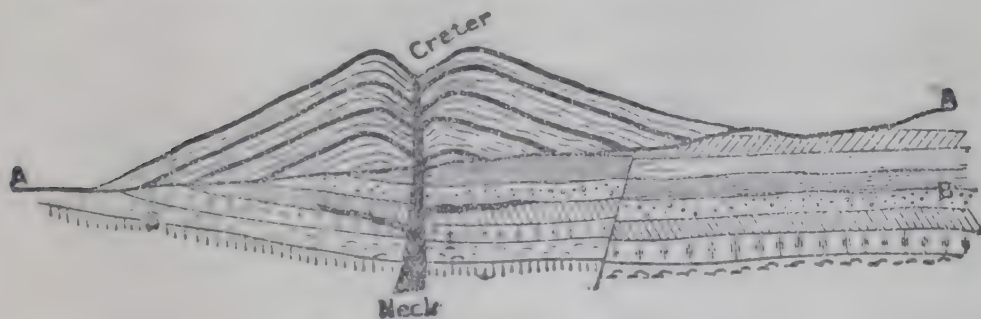


FIG. 42.—SECTION OF VOLCANO.

solfatara. In Iceland, the Crimea, and Java there are conical mud-volcanoes called **salses**.

Take a blank map of the world (Mercator's Projection) and mark the following places in red. The Andes, the Rocky Mountains, the Aleutian Islands, the Kurile Islands, Japan, the Philippine Islands, New Guinea, New Hebrides, New Zealand. You have drawn a red line which practically bounds the Pacific Ocean. This red line marks a region of active or extinct volcanoes. In South America some of the loftiest active volcanoes in the world are found. The highest is Cotopaxi, 19,613 feet. There are also many dormant or extinct volcanoes. In Central America, the chief volcanoes are Orizaba and Popocatepetl. There are few active volcanoes in North America. What volcanoes exist are either in the solfatara stage, or else extinct. There are, however, a number of geysers, or eruptive hot-springs. In Japan there is the famous and beautiful Fuji Yama. In North Island (New Zealand) there are many geysers and hot springs. The water which is ejected often contains large

quantities of silica and other compounds, which in time form deposits round the mouth of the geyser.

In the Atlantic Ocean the belt is not so distinct. Mark the following volcanic areas. Jan Mayen, Iceland, Azores, Ascension Island, St. Helena. The extinct part of the chain is marked by the lava of the western islands of Scotland and the basalt of the Giant's Causeway. You may consider the line of volcanoes in the Mediterranean, marked by Etna, Vesuvius, Stromboli, etc., as a branch of this Atlantic system.

Now observe that all the volcanoes are near the sea. The waters of the ocean sink down into the interior of the earth. When they reach the hot interior they are turned into steam and this steam being under considerable pressure bursts open the earth, just as it would a boiler. The extinct volcanoes that are found inland were once near the sea. But by their own action, they raised the land, the water receded, and eruptions were henceforth impossible.

The results of volcanic action are often terrible. At the time when Herculaneum and Pompeii were buried the top of Vesuvius was completely blown off. In 1865 during an eruption of Etna, 2,800,000 cubic feet of water were ejected as steam. Cotopaxi has been known to throw a stone weighing 200 tons for a distance of 9 miles. In May and August, 1902, the island of Martinique was devastated by the eruptions of Mount Pelée. The capital, St. Pierre, was entirely destroyed and 32,000 people lost their lives. The chief products of a volcanic eruption are :

- i. Vapours and gases, of which steam is always one.
- ii. Stones and ashes, which may vary in size from fine dust to enormous masses of rock.

- iii. Lava, which is molten rock. In 1669 Etna ejected a stream of lava 14 miles long and 9 miles wide. "Few sights in nature are more terrible than that of a lava torrent as it issues and pours down the side of a mountain. At first it glows with a white light, and flows freely like melted iron. It rapidly grows red and darkens; at the same time its surface hardens into a black or brown crust which breaks up into rough cinder-like pieces, beneath which, as you may see at the rents, the main mass still remains red-hot. A short way from the point of emission the lava-stream

looks like a river of rugged blocks of slag, grinding against and over each other with a harsh metallic sound, and revealing every here and there a glimpse of the fiery flood underneath over which they are floating. Clouds of steam and hot vapours rise from all parts of the moving mass. Its rate of march varies much according to the slope of the ground, distance from the point of exit, and other causes. Thus, in the year 1805, a current of lava ran down the first three miles of the slope of Vesuvius in four minutes, yet took three hours to reach its furthest point, which was only six miles" (Geikie).

A volcanic eruption is generally preceded by an earthquake. When the eruption ceases the earthquake ceases too. Earthquakes are most common where volcanic action is strongest. These facts would seem to suggest that there is some connexion between earthquakes and volcanoes. What is the real cause of an earthquake is rather uncertain. Some people think that it is caused by a subterranean explosion of steam. Others suggest that during the cooling of the earth and its consequent contraction, the earth cracks in its weakest places. Others again say that when lava is suddenly injected between the various strata, the rocks are caused to vibrate and that when the vibration reaches the surface an earthquake is produced.

An earthquake is a wave-like motion of the earth's crust. The wave spreads out from a centre which is called the **centre of impulse**, or the **seismic centre**. The vibrations travel with equal velocity in all directions. A line drawn vertically from the seismic centre to the surface of the earth is called the **seismic vertical**. The depth of the seismic centre is never greater than 30 to 35 miles and is generally at a depth of from 6 to 7 miles. The wave travels with a rate varying from 60 to 2,500 ft. per second, the rate depending on the character of the earth's crust at the place where the disturbance occurs. It travels fastest in hard rocks like granite, and more slowly in softer materials, like clay.

The effects of earthquakes are as terrible as those of volcanoes. In 1755 Lisbon suffered from an earthquake that destroyed 60,000 persons in a few minutes. The shock

was felt in the Alps, the Pyrenees, the Scandinavian Mountains, and as far away as the West Indies and Morocco. In 1822 an earthquake in Chile raised the level of Valparaiso between three and four feet, and in 1906 another earthquake reduced the city to ruins, and also the towns in the surrounding area.

One of the most recent of disastrous earthquakes occurred in Jamaica on January 14, 1907, when the town of Kingston "seemed to shrivel up, and the buildings crashed together and fell into crushed masses like egg shells."

As volcanoes and earthquakes are connected, the earthquake areas are found chiefly in the volcanic areas. But there are no places that do not at some time or other experience shocks to a greater or less degree.

REVISION EXERCISES

1. Describe the structure of a coral island and discuss the mode of formation of such islands. O. J., 1898.

2. Compare the Congo and Amazon basins taking into account position, height, climate, and the course of the main stream. L. J. S., 1904.

3. On a map of India mark the Vindhya Mountains and the Khaibar Pass; the Rivers Indus, Narbada, and Jumna. Show the positions of the Province of Madras, and the Punjab and the towns Calcutta, Allahabad, Karachi, Delhi, and Bombay. O. P., 1906.

4. State what is meant by *outcrop* and *fault* and illustrate your answer with diagrams. C. S., 1896.

5. Give an account of the distribution of volcanoes on the earth, and point out any relation between this distribution and the general relief of the land surface. Describe the principal effects of volcanic action on the form of the land. O. S., 1897.

CHAPTER VIII

GLACIERS AND ICEBERGS

Snow falls upon the tops of all high mountains, even on the equator. At a given height in any latitude, the temperature is always below 32° F., and consequently, above that height, snow is always to be found. The line above which there is perpetual snow is called the **snow-line**. The height of the snow-line above the sea-level depends on latitude, slope, etc.

At the Poles it is at the sea-level. On the dry cold north side of the Himalayas it is at a height of 20,000 feet but on the warmer south the height of the snow line is 16,000 feet. This is hardly what you would expect at first sight, for as a rule the snow-line is at a greater height on the southern than on the northern slope. Thus in the Alps, the snow-line lies on the north side at a height of 8,000 feet, while on the warmer south it is at a height of 9,000 feet. But in the case of the Himalayas, their great height causes the moisture brought from the Indian Ocean to fall as snow on the southern side and allows comparatively dry air to pass. Then also the dry air which rises from the heated plains of Thibet hastens the evaporation of the snow on the northern side.

LIMIT OF PERPETUAL SNOW SOUTHERN HEMISPHERE

	Latitude.	Height in Feet.
Andes (Quito)	0°	15,748
Kilima Njaro	3°	16,404
Andes (Chile)	28°	18,044
" "	30°	16,076
" "	34°	11,154
" "	38°	6,889
" "	50°	2,624
Alps (New Zealand)	46°	7,808

Plot a curve showing the variation of the height of the snow-line with the latitude.

If the snow which falls at these heights were not removed in some way, the mass would become of enormous thickness. Some of it is lost by evaporation and melting, but the greater part is removed either by avalanches or glaciers. When the sides of a mountain are steep, huge masses of snow fall into the valleys below, melt, and disappear. Such a fall of snow is called an **avalanche**. At times whole villages, in Switzerland, have been buried under the snow that has descended without warning from the heights above.

The forests in such places are carefully preserved as they serve to break the fall of the avalanche and rob it of part of its destructive power. In parts where avalanches are common, the roads are often covered with strong archways.

Where the valleys are not so steep the snow collects year after year. The lower layers are gradually compressed by those above, and under this enormous pressure, they are converted into ice. The ice slips slowly down the valley and forms a **glacier**, a river of ice. Just as a river serves to drain away water, so a glacier serves to drain away snow. The glacier moves much more slowly than a river, so slowly, in fact, that its motion is not apparent to the naked eye. But if a stake be fixed in the glacier, and its position noted with reference to some object on the mountain side, it will be found after a few days that the stake has been carried by the glacier a short distance down the valley. If a row of stakes be placed horizontally across the glacier, it will be noticed that the stakes in the middle move further than those at the edge, thus proving that the centre of the glacier moves faster than the sides. This is also the case with a river of water. At the same time, the ice, being solid, cannot be said to **flow** like a river. It slides rather than flows, and when it reaches a precipice, it can only descend by breaking. The broken pieces are usually pressed together again afterwards and reunited. The cracks which appear in the glacier are called **crevasses**. Huge stones adhere to the bottom of the glacier, and as it moves along, the stones scratch the bed and sides of the valley. They, at the same time, get crushed and rounded. Much fine dust is produced, which is carried away by the stream flowing along the bed of the valley, for there is always a condition of thaw at the bottom of the glacier. When the glacier ends, the stream flows away, bearing in its muddy current some of the products of the work done by the glacier upon the sides and bed of the valley. One of the great tasks in which every glacier is unceasingly engaged is the erosion of the valley.

The *débris* which falls upon the glaciers from the mountain sides is called a **moraine**. When the moraine is at the side it is a **lateral moraine**. When two glaciers meet, both of the lateral moraines usually unite to form a **medial**

moraine. Where the glacier ends, the rubbish is deposited as a terminal moraine. Large blocks of stone are conveyed by the glaciers for long distances. When the glaciers melt and so disappear, the stones are left on the ground to mark where the glacier once existed. 6

Professor Huxley states that there is evidence of a terminal moraine, as far south in England as Finchley. Thus the glacier performs another task in the transport of material from one place to another.

There are at least 60 large, and 1,000 smaller glaciers in the Alps, at the present time. Their average velocity is about 300 feet in a year. The glaciers of Greenland are larger and move more quickly. They have been known to move 100 feet during a summer day.

"To realize as clearly as possible the general appearance presented by a glacier, let us suppose ourselves placed at the lower end of one of those among the Alps. On either side of the valley, the slopes are clothed with pine. Patches of green pasture catch the sunlight in the hollows and on the lower projecting hills; while around us lie scattered cottages and bright meadows. In front stands the abrupt end of the glacier—a steep, but broken slope of ice, from the base of which issues a river of pale muddy water. Numerous large blocks of rock are scattered about on the valley bottom below the ice. The ground there, indeed, is mainly composed of coarse shingle, like that which forms the bed of the present river. Even on the ice itself we may see heaps of stones, some, perhaps, poised just on the verge of the last steep slope of the glacier, whence they must soon roll down to join the crowd of others which have preceded them. Looking into one of the deeper rents in the ice, we see it to be of wonderful purity, and of the most exquisite blue colour. And yet most of its outer surface is so obscured by earth and stones, that at first, perhaps, we can hardly be persuaded that this same clear, transparent ice really lies below.

"We ascend to the surface of the glacier either by mounting among the broken cliffs of ice forming its abrupt front, or by choosing a safer and easier path up the slope on one side of the valley. The ice is now seen to lie as a great sheet

filling the bottom of the valley from side to side, and stretching far up into the heart of the mountains. Its surface has at first a gentle slope, and is comparatively smooth, though many glaciers even at the lower end present a marvellously rugged aspect, like that of a tempestuous sea suddenly frozen. The ice is much obscured in places by earth, gravel and stones which cover it. As we ascend the valley we notice that these surface accumulations are especially abundant along the sides of the glacier, and likewise in one or more ridges along its centre. During the day, when the sun shines out warmly, the surface of the ice is thawed, and consequently little runnels of water flow over it. At night, when these are frozen, the glacier becomes once more silent" (Geikie).

The Greenland glaciers descend into the sea and after a time huge pieces are broken off. These float away as icebergs. They stand up 60 to 300 feet out of the water, but the part which is seen is only a small portion of the whole. An Iceberg, with 300 feet above the surface, would have about 2,400 feet below the water. The largest icebergs are formed in the Davies Strait. As many as 400 a year are floated south by the Labrador Current. Many of these get stranded on the coast, others float as far south as Newfoundland, but few succeed in passing the Gulf Stream. The glaciers lower the temperature of the air for miles around and exert a very marked cooling influence on the shores of Labrador. Those which float away south, melt soonest at the base, and when they have become top heavy, they topple over and cause disturbances in the sea. When they come into contact with warm moist air they cool it, condense the moisture, and so cause fogs. Many a vessel has been lost through collision with icebergs that were hidden in fogs produced in this way.

Icebergs, like glaciers, carry *débris*, in the form of rocks, stones, etc., to the sea. It is said that the banks of Newfoundland have been formed by *débris* deposited by icebergs.

As the South Polar region has been less explored than the North Polar region, there is less known about it. The South Pole is probably surrounded by an island continent,

covered by an enormous ice-cap. The icebergs formed in these regions have flat tops, perpendicular sides, and comparatively little débris.

When the surface water of the ocean freezes, we get *floe-ice*, or *field-ice*. In early summer this begins to break up, and noises like the reports of a cannon fill the air. The pieces float away with the current. Through the lanes of water that are now formed, vessels can make their way for a time. But after a more or less long interval of time, the whole mass becomes reunited. Ships, passing amongst this *floe-ice*, are always in danger of being crushed to pieces by the driving together of large masses of ice. Sometimes the ship gets frozen into the ice, and carried hundreds of miles as the ice drifts with the current.

In North Greenland there is a cake of ice round the shore called the *ice-foot*. It is caused by the freezing of the water round the shore and its subsequent upheaval by the tide, and attachment to the land. It is often completely hidden by the rubbish that has fallen upon it from above. When storms come it is often broken to pieces. Large portions are then drifted out to sea.

REVISION EXERCISES

1. Give some account of the origin of chalk. C. J., 1894.
2. What parts of Canada are the most densely populated and which the least? Why? L. J. S., 1904.
3. Draw a map of Australia, marking the position of the different states, their capital towns and the chief mountain ranges. O. J., 1890.
4. Describe as fully as you can the manner in which a glacier is formed and the effects produced by it in its course. What evidence is there of the existence of ancient glaciers in Great Britain? O. J., 1896.
5. Draw a series of maps showing the form of a typical cyclone and insert arrows showing the direction of the wind in different parts. O. S., 1899.

U.D.C. No:

Date;

CHAPTER IX

SPRINGS, RIVERS, LAKES

THE rain water which falls upon the earth is removed mostly in one or other of the three following ways:

- i. About one-third goes back to the air. It is evaporated.

- ii. About one-third soaks into the ground, and finds its way out again by means of springs.
- iii. About one-third runs down the slopes, to the rivers, the lakes and the seas.

The water which sinks into the ground passes through porous rocks or soils, such as gravel, sandstone, limestone, etc. It cannot sink through clay, slate, or granite. It passes down through the permeable rocks, until it reaches an impervious bed, such as clay. If the surface of the impermeable bed slopes, the water runs along the sloping surface and finally gets out of the hill as a surface spring.

Water is a very good solvent of many substances, and as it trickles through the earth it dissolves varying quantities of the substances through which it passes. It is the presence of large quantities of dissolved matter that gives rise to the so-called mineral springs. The chief mineral substance in solution is often lime. Such springs are called **calcareous** springs. Other springs contain much iron, and they are then called **ferruginous** or **chalybeate**. Those in which large quantities of salt are dissolved, are **brine** springs. The chief mineral springs in this country are at Harrogate, Buxton, Matlock, Bath, Cheltenham and Leamington.

Water dissolves carbonic acid gas. The solution of the gas dissolves chalk. When the water is exposed to the air for some time, it loses its carbonic acid, and the chalk is deposited. The dissolving action of water charged with carbonic acid is responsible for the great caves which are often found in limestone rocks. Such caves are found in Derbyshire, Somersetshire, Austria and in Kentucky, where the Mammoth Caves form a great natural curiosity. In some of these caves curious rock forms are seen. They are produced in the following way. A drop of water, containing dissolved chalk, trickles through the ground till it reaches the roof of the cave. Here it hangs for a little while. Some of the water is evaporated, some of the gas is lost, and a little chalk is deposited on the roof. Then the drop of water falls to the ground. It evaporates and leaves a little chalk on the floor. In time, two columns of lime are built up, one from the roof and one from the floor. The former is called a **stalactite** and the latter a **stalag-**

mite. The two columns sometimes unite and form a solid pillar.

As we have already remarked, about a third of the rain-water is removed by rivers, etc. Various names are given to the river in its several parts. The **source** is the place where the river begins, the **mouth** is the place where the river ends. If you look in the direction in which the river is flowing, the **right bank** is on your right hand, and the **left bank** is on your left hand. The direction in which the river flows is called its **course**. The smaller streams that run into the main stream are called its **tributaries**, and the place where the tributaries join the main stream is called the **confluence**. The area drained by the river and its tributaries is the **basin**. The land which divides two river basins from each other is called the **watershed**. In what directions do the main watersheds of (a) Europe, (b) North and South America, run?

Rivers move with varying velocity, depending on the slope of the river, its width, etc. As the river moves along, it erodes the land, both chemically and mechanically. It carries away many small particles and it rolls stones and pebbles from one part of its bed to another. The faster it moves the greater is its power to transport material. When the river reaches the sea, its speed decreases. The larger stones and pebbles are collected and form a solid bottom to the river. In this way the size of the bed is lessened, and in times of flood this accumulation often forces the river to change its bed.

The amount of material carried to the sea by rivers is enormous. In 144 years the Ganges deposits in the Bay of Bengal as much soil as would cover the whole of Ireland to a depth of one foot. The river Rhone is said to carry annually past Avignon 8,290,464 tons of salts, dissolved in the water, and the Danube during flood time has been known to deposit 2,500,000 tons of mud and silt in twenty-four hours, in the Black Sea. In this way the level of the land is being gradually reduced, the seas are being made more shallow and lakes and valleys are being filled up.

Where the bed of the river is very hard, the effect of the running water is very small, but where the bed is soft,

the effect is great. If a whirlpool or eddy occurs in a place where the river bed is soft, hard stones get whirled round and round. They thus scoop out holes in the bed called **pot-holes**. These are sometimes several feet deep.

The most remarkable instance of erosion is seen in the cañons of Colorado, where the Colorado River has cut its way backwards for 300 miles, and has excavated a great gorge 3,000 to 6,000 feet deep, with almost perpendicular sides. In the same way the Niagara Falls are gradually receding at the rate of about 5 feet a year, for the water, as it falls incessantly over the edge, wears away the rocks over which it falls.

The deposition of suspended matter at the mouth of a river sometimes produces a bar and sometimes a delta. When the current of the river comes in contact with the sea, the sediment is arrested. The stones and gravel that have been rolled along the bottom also get stopped, and thus the bar is built up. Fresh materials are also added by the sea on the outer side. In times of flood, the force of the river water is often sufficiently great to alter the position of the bar. A shifting bar of this kind is a great hindrance to navigation.

In some cases the bay or gulf into which a river flows gets filled up with the materials brought by the river. The new land thus formed is flat and triangular shaped, and is known as a **delta**. The best examples of deltas are found at the mouths of the Nile, Ganges, Rhine, Mississippi, Rhone and Po.

The delta of the Mississippi advances seawards at the rate of 86 yards per annum. Adria, on the delta of the Po, was the port that once gave its name to the Adriatic Sea. It is now 14 miles inland. All rivers do not form deltas. Sometimes the rivers themselves flow with sufficient velocity to carry the sediment out to sea, as is the case with the Congo, or else ocean currents sweep past the river mouth and carry the sediment away.

Lakes.—A lake is a large body of water completely surrounded by land. Take a map of Europe, or separate maps of Russia, and Sweden. Notice the abundance

of lakes. To what degree of latitude do they reach as you come south? Look at North America. Beyond what parallel of latitude do the lakes lie? In Finland there are so many lakes that nearly a third of the country is covered with water and marshes. In the countries you have examined the lakes are not in the valleys only, but are scattered all over the surface and at all heights. A great many of these lakes lie in hollows scooped out by the glaciers in former times, or in hollows left amongst heaps of *débris*.

Do the lakes of the following countries lie amongst hills or on the flat land—Scotland, England, Switzerland? The hollows in which these lakes lie have either been (a) scooped out by glaciers, or (b) formed during the elevation of the mountains, or (c) formed by the piling up of *débris* by glaciers. In volcanic districts the lake hollows are often the craters of extinct volcanoes. Examine a map of Africa. Name the great lakes. They lie on a tableland. Examine a map of Asia. There are many lakes in Tibet, Turkistan and Mongolia. These also lie on a tableland. The tableland lakes lie in depressions in the surface.

Lastly we have the lagoons, which are shallow lakes lying near the sea shore, parallel to it and separated from the sea by a strip of low land. The most famous lagoon is that on which Venice lies.

Lakes have always a tendency to disappear. If no stream runs into them, the water tends to disappear by evaporation, and the water to become more and more salty. If streams do run into them, the streams deposit a sediment and gradually fill them up. If the lake has fresh water running into it, and also a stream running out of it, it is kept fresh and does not become salty. The chief salt lakes of the world are the Dead Sea, the Caspian Sea, the Sea of Aral, and the Great Salt Lake of North America.

Lakes serve many useful purposes. They act as reservoirs, storing up water for the future; they often prevent floods, by providing an area into which surplus waters can be received; they modify the climate of the regions in which

they lie, as the presence of large masses of water always tends to prevent extremes of temperature.

REVISION EXERCISES

1. The coast-line of many countries is in some parts much indented and in others unbroken. How does the country inland from the one kind of coast usually differ from that inland from the other? Give examples. O. P., 1907.

2. Describe the position of Glasgow, and mention as many reasons as you can why Glasgow has become the second biggest city in the British Isles. O. P., 1907.

3. On the accompanying map the heights (in feet) above the sea-level are given at a number of points. Draw the contour lines at intervals

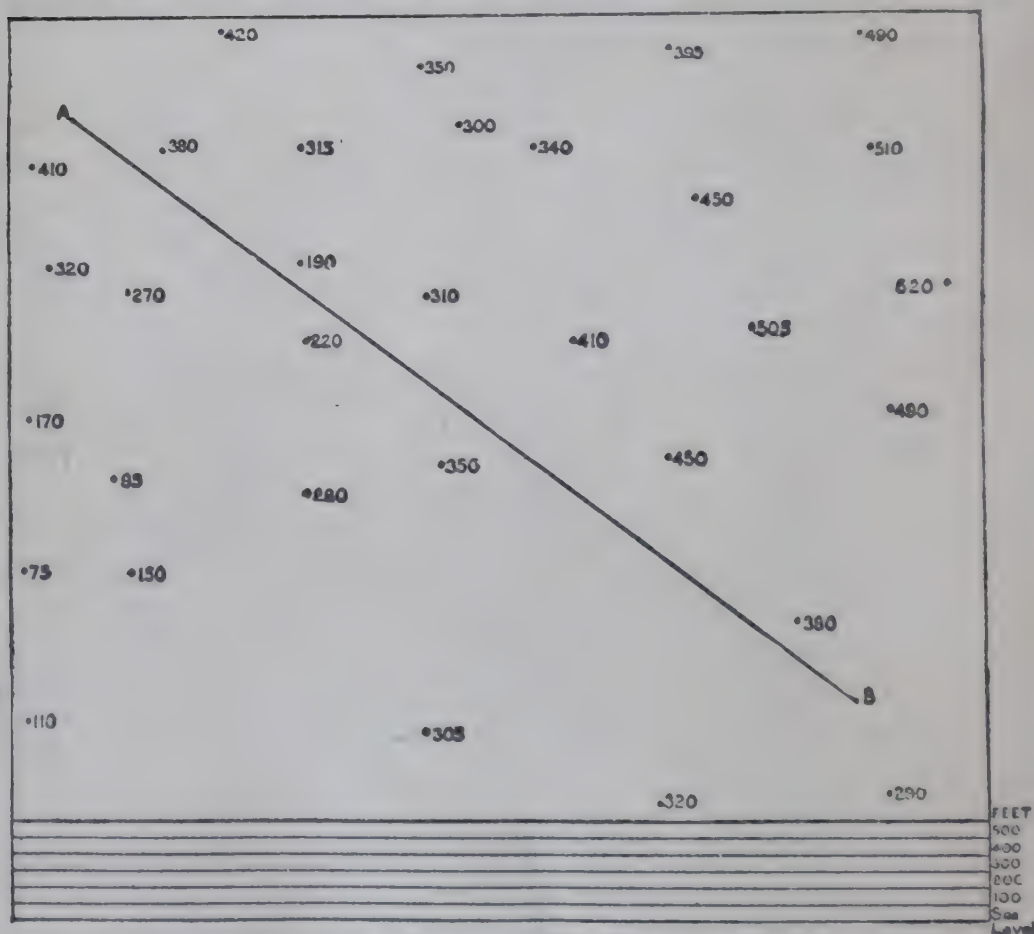


FIG. 43.—CHAPTER IX, EXERCISE 3.

of 100 feet, and in the space provided below the map draw a section along the line A.B. C. S., 1904.

4. What is a water-parting? Show by means of a map how the Alps determine the courses of the rivers of S.E. France, W. Germany, and N. Italy. O. J., 1896.

5. Explain why certain inland lakes are salt, while others are fresh. Give instances of both. C. J., 1892.

CHAPTER X

DISTRIBUTION OF FLORA AND FAUNA

THERE are many causes which determine what plants or animals can flourish in any given district. The most important of these may be summarised as temperature and rainfall, and these vary, as we have learned in our lessons on "climate" (see Part I) with altitude, latitude, nearness to the sea, etc.

In the Tropics, we find that at the lower levels, the characteristic tree is the palm. At higher levels we get successively tree-ferns, myrtles, evergreens, deciduous trees, conifers and lichens. The chief cultivated plants, beginning at the bottom and ascending gradually, are spices, sugar-cane, cotton, maize and rice, wheat and flax, barley and oats.

Starting from the equator, the temperature falls (*a*) as we ascend the mountains, (*b*) as we go either north or south. The plant areas follow one another as we pass from the equator to the poles in the same order as they do when we ascend the mountains. The boundaries of the plant areas are not determined by the parallels of latitude but by the isotherms. When the same kind of plant grows through many degrees of latitude the influence of temperature is shown in the different times at which the plants come into leaf or bear their fruit. Thus cherries ripen in the south of Italy about the beginning of May, but they do not ripen in England till about July. The elm comes into a leaf at Naples at the beginning of February, but in England not till the middle of April.

Wheat and rye will germinate at a temperature between 0°C . and 1°C ., while maize requires a temperature between 5°C . and 11°C . The length of the seasons is also an important factor, for wheat requires a fairly long dry autumn in which to ripen, while grasses need only a short hot summer.

The following general considerations will help you to

determine from maps showing rainfall and temperature what kinds of plants are likely to grow in a particular area.

- i. If there are extremes of temperature, or if wet and dry seasons alternate, then the plants have a period of active growth and one of rest. The period of rest may be passed in the form of seeds, or underground roots and stems, or in a woody leafless condition.
- ii. Where we have both great heat and heavy rains there are dense forests.
- iii. Where there is great heat, but little rain, we have deserts.
- iv. In temperate regions, with good rainfall, we have forests of conifers and deciduous trees.
- v. In temperate regions, characterised by continental climates, grass lands are often found.
- vi. Arctic regions are characterised by the dreary tundras.

The animals of the world are dependent largely on the plants of the world for their food, and hence their distribution is, in a way, dependent on the climate. They are limited in their movements by such geographical features as rivers and mountains. Plants are not limited by geographical features in this way. Seeds are carried by the wind, floated over the sea either on the water itself or on floating masses of wood or vegetation, and carried in the feathers of birds and the fur of animals. Should the seeds fall in a place where the soil and the climate are suitable, they germinate and produce the full-grown plant.

Animals also move from place to place, both voluntarily and involuntarily. Monkeys have been floated down rivers on drift wood, polar bears have been carried far from home on icebergs. Birds fly from country to country in search of warmer climates where they can find food, and the same necessity for obtaining food has often compelled the migration of bison, beavers, and squirrels. On the other hand, many animals are confined to particular areas of the earth's surface because they can live only in woods, or marshes, or jungles and so on. We cannot

imagine a polar bear in an equatorial forest, or a peacock spreading its gorgeous plumes on a Greenland glacier.

The distribution of animals and plants is not the same to-day that it has always been. Fossils found in the rocks of many countries show that animals which once lived in those countries are now only to be found in distant regions. The elephant and the rhinoceros once lived in England. This points to the fact that the climate of England must at one time have been different from what it is at the present day.

Wallace has divided the world into six regions, each of which has its own characteristic plants and animals. Take a blank map of the world and colour the different regions with distinct colours.

i. The Palaearctic Region.—This includes Europe, Africa north of the Sahara, and Asia with the exception of the southern peninsulas. The boundary on the north is the sea. The boundary to the south is formed by the Sahara, Libyan, Indian, and Arabian deserts, the Sulaiman and Himalayan mountains and a part of China. In the Arctic part of this region there is the tundra district with mosses and lichens and in certain places, flowering plants, such as the saxifrage and the gentian. These are followed by stunted willows, azaleas and rhododendrons, with low scrub on the hillsides. South of isotherm (not latitude) 32° pine trees appear, and they extend to the south of the region, wherever there is high land which is cool enough to suit their growth. Between isotherms 40° and 60° , we get the forests of deciduous trees such as the birch, alder, beech, ash, oak, elm, sycamore, walnut, chestnut and maple. All these trees shed their leaves in the autumn. We find here also, such fruits as the cranberry, strawberry, currant and raspberry. Farther south are almonds, olives, figs, grapes and oranges. Cereals, such as wheat, barley, and oats, are grown in most parts. Between 60° and 70° the trees are evergreens, such as oak, myrtle and laurel.

In the far north we find the white bear, fox, reindeer, whale, walrus, seal, white owl, and ptarmigan. Coming south we have the brown bear, badger, otter, horse, buffalo, deer, chamois, wild goat, wild sheep, hare, rabbit, mole,

hedgehog, golden eagle, hawk, grouse, pheasant, sparrow and thrush. In the most southern part of this region the camel is the most characteristic animal.

ii. **The Ethiopian Region** is bounded on the north by the Palaearctic Region. It covers Central and Southern Africa, and the tropical parts of Arabia, Madagascar, and the neighbouring islands. In the desert parts the plants have leathery leaves to prevent loss of moisture by evaporation, or perhaps bulbous and fleshy roots and stems for storing water, and often thorns and prickles which keep them from being eaten by animals. In Africa, south of the Sahara, we recognize an eastern and a western region. In the east there are the grass lands of the plateaux, dotted here and there with forests. In the west there are the dense tropical forests containing the oil palm, the rubber tree, and the tamarind. In Southern Africa there is an immense variety of heaths. The animals of the Ethiopian Region are the gorilla, chimpanzee, baboon, lemur, lion, leopard, zebra, rhinoceros, hippopotamus, giraffe, antelope, elephant, ostrich, chameleon, crocodile.

iii. **The Oriental Region.**—This is bounded on the north by the Desert of Arabia, and the Sulaiman and Himalayan mountains. It includes Formosa, Borneo, the Philippines, and the Malay Islands as far as the south-east end of Java. In parts there are dense tropical forests. The plants include ginger, arrowroot, banana, coconut, bamboo, rice, mango, coffee, ebony and hemp.

The fauna includes certain varieties of monkeys, the tiger, hyena, jackal, wild cattle, elephant, rhinoceros, parrot, peacock, cobra, crocodile, and many remarkable specimens of butterflies and beetles.

iv. **The Australian Region.**—This includes Australia, New Zealand, and the islands east of Java, Borneo, and the Philippines. The chief plants are heaths, eucalyptus, acacia, fig, nutmeg, coconut, bread-fruit.

The fauna is very peculiar and includes egg-laying mammals, pouched animals like the kangaroo, the emu, cassowary, lyre bird, and bird of Paradise.

v. **The Neotropical Region.**—This includes South America, the islands of the Antilles, and the tropical part

of North America. It stretches from the Tropic of Cancer to latitude 56° S. and it climbs to the snowy tops of the Andes. In the lower parts of the tropical districts there are mangroves, palms, bananas, and tree ferns. These grow in dense forests. They are linked together by gigantic and innumerable creepers. The same areas are abundantly supplied with ferns, orchids, passion-flowers, and various species of cactus. In the basin of the Orinoco are the **llanos**, park-like plains with tall grasses, clumps of trees, and various species of particularly brilliant lilies. In the La Plata basin are the fertile grassy **pampas**. Farther south, in Patagonia and Tierra del Fuego there are barren lands.

Amongst the trees on the lower parts of the mountains are the cinchona (from whose bark quinine is obtained), mahogany, rosewood, and india-rubber. At the higher levels there is a wealth of calceolarias and gentians.

Amongst the animals are the monkey, jaguar, puma, guinea-pig, antler, sloth, opossum, humming-bird, rhea (the American ostrich), boa-constrictor, alligator, crocodile, tortoise, turtle, and a varied collection of insects.

vi. **The Nearctic Region.**—This includes North America, north of the Tropic of Cancer. In the far north, the cold is too intense for any form of plant-life except the very lowest, but in the south we get sugar-cane, cotton, maize, and tobacco. In California and Oregon, there are the great Wellingtonia and Douglas pines. East of the Rocky Mountains stretch the pasture-lands and the prairies. In the British possessions there are great forests of useful timber. The animals include the moose-elk, reindeer, racoon, beaver, bison, grizzly bear, black bear, puma, lynx, antelope, opossum, humming-bird and rattlesnake.

REVISION EXERCISES

1. Describe shortly, conditions which may give rise to a surface spring. O. J., 1907.
2. If the sea-level rose 600 feet all the lowland parts of Great Britain would be submerged. Describe shortly, or show by a sketch, what the map of Great Britain would look like. O. J., 1907.
3. Insert the rivers in the accompanying map (Fig. 44). Draw the route from B to C which would involve least climbing. Make a section from B to C in the space provided, using the same horizontal scale as

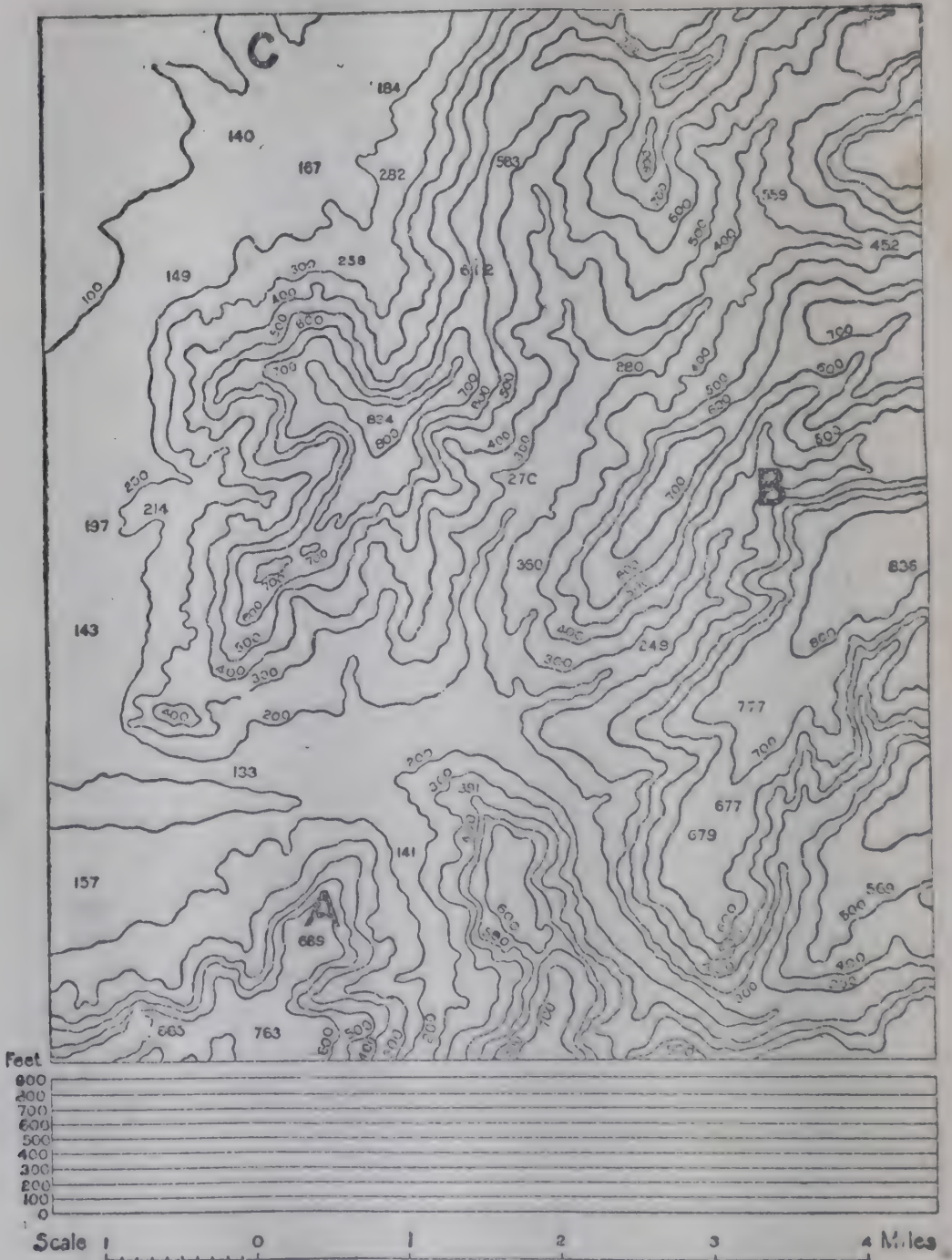


FIG. 44.—CHAPTER X, EXERCISE 3.

that of the map, and the vertical scale shown. What are the distances between A and B, and A and C? What is the area of the map?

L. J. S., 1906.

4. How would you subdivide the land of the Eastern hemisphere into regions characterized by peculiar assemblages of terrestrial animals?

How can the distribution of such animals be any guide as to the past history of land and sea ? O. S., 1897.

5. How is the rainfall of a district determined ? Contrast the mean annual rainfall of Wales, and of Westmoreland and Cumberland, with that of Suffolk and Norfolk. What reason can you give for the difference ? O. J., 1896.

ASIA.

CHAPTER XI

POSITION, SIZE, ETC.

EXAMINE a map of the world. What continent lies on the west of Asia ? The two continents together are sometimes spoken of as Eurasia. What mountains separate Europe from Asia ? This range of mountains is too low to present any real obstacle to traffic, and the Russians have not found it any barrier to the extension of their empire eastwards. What continent lies to the south-west of Asia ? How was Asia once joined to this continent ? How has the link been broken ? What separates Asia from America ? About how wide is it ?

On how many sides is Asia washed by the sea ? Name the several oceans and their chief seas.

Between (a) what parallels of latitude, and (b) what meridians of longitude does Asia lie ? How many degrees nearer the North Pole is the mainland of Asia than that of North America ? How many degrees nearer the Equator is (a) Singapore than Panama, (b) Hongkong than Havana ? How many degrees is it from the southern end of the Malay Peninsula to Cape Chelyuskin ?

Draw on a map a circle with a radius of 2,000 miles, so as to enclose as much land as you can. Draw also two lines inland parallel to the coast at distances of 500 miles and 1,000 miles respectively. What do these lines show ?

What parts of Asia are crossed by the Arctic Circle, the Tropic of Cancer and the Equator?

The areas of some of the continents are given below in thousands of square miles.

Asia	.	.	.	.	.	.	.	17,000
Africa	.	.	.	.	.	.	.	11,250
North America.	.	.	.	.	.	.	.	8,250
South America.	.	.	.	.	.	.	.	7,000
Europe	.	.	.	.	.	.	.	3,750

Draw a series of rectangles, on a convenient scale, so as to compare these areas. Let one angle in each rectangle coincide with one angle in each of the others.

Asia is the largest of all the continents and contains nearly one-third of the land of the globe. About how far is it (a) from Cape Chelyuskin to Singapore, (b) from Cape Baba (in Asia Minor) to East Cape on Bering Sea, (c) from Singapore to the Equator? If 15 degrees of longitude correspond to one hour's difference in time, what is about the difference in time of eastern and western Asia?

Notice how many peninsulas there are. Nearly one-fifth of Asia consists of peninsulas, but neither the peninsulas nor the continent as a whole possess deeply indented shores. The peninsulas bear a certain resemblance to those of Europe. Arabia corresponds to Spain. They are both high, dry, tablelands, with narrow, coastal plains, and regular unindented coasts. India, with its southern plateau, and its northern plain encircled by the Himalayas, corresponds to Italy with its Apennine Heights, and the Alp-girdled plain of Lombardy. In both cases, the northern mountains shield the plains from cold winds. The island of Ceylon corresponds to the island of Sicily. There is a certain amount of resemblance between Indo-China with its East Indian Archipelago, and the Balkan Peninsula with the Grecian Archipelago, and between the mountainous wooded peninsula of Kamchatka and that of Scandinavia. The Japanese Islands may be compared with the British Isles. The peninsular development is greatest in the south, west, and east, where the land is fertile. This is a very fortunate arrangement so far as civilization and commerce are con-

cerned, as it gives access to lands where population is dense and land productive.

REVISION EXERCISES

1. Explain fully why the sun has greater heating power in the northern hemisphere during July than during December. O. J., 1907.
2. Explain briefly from a geographical point of view : (a) Why Ireland is a comparatively poor country, and (b) What are its chief elements of commercial wealth.
3. On a map of India trace the courses of the Jumna, Mahanadi, Godavari, and Tapi, and mark Delhi and Allahabad; insert also Adam's Peak, the Khyber Pass, Point de Galle, Mount Everest, the Malabar coast, Simla, Sind, Baroda, Patna, Aicot, Nepal, the Nilgiri Hills. O.J., 1894.
4. What Asiatic peninsulas correspond in position to those in the Mediterranean ? O. J., 1895.
5. The maps supplied (Figs. 45) show the distribution of barometric pressure over western Europe on the dates and at the hours specified. Describe the changes in the weather experienced in London during the period. C. S., 1906.
6. On a map mark : the Tarim basin and the plateau of Iran; the rivers Lena, Mekong, and Oxus; the islands Borneo and Sakhalin, and Lake Baikal; the towns Kabul, Manila, Tokio, Allahabad, Vladivostok. O. S., 1907.

CHAPTER XII

SURFACE

EXAMINE a physical map of Asia. Is there much land at or below an elevation of 600 feet? In which parts of the continent are the low-lying lands situated? Name those parts of the continent where the land has an average elevation over 3,000 feet. Notice (a) a northern plain running east and west, (b) a belt of high land stretching from Asia Minor to the Pacific, (c) the southern peninsular highlands. The belt of high ground may be divided for purposes of description into three systems: (i) the Central, which includes all the various ranges that form the buttresses of the great tableland of Central Asia; (ii) the Western, from the shores of Asia Minor to the Lower Indus; (iii) the Eastern, which includes all the ranges lying on or near the east coast of the continent from Bering Sea to the southern extremity of the Malay Peninsula. The isolated mountain systems of India and Arabia can be considered with the Western and Central systems respectively.

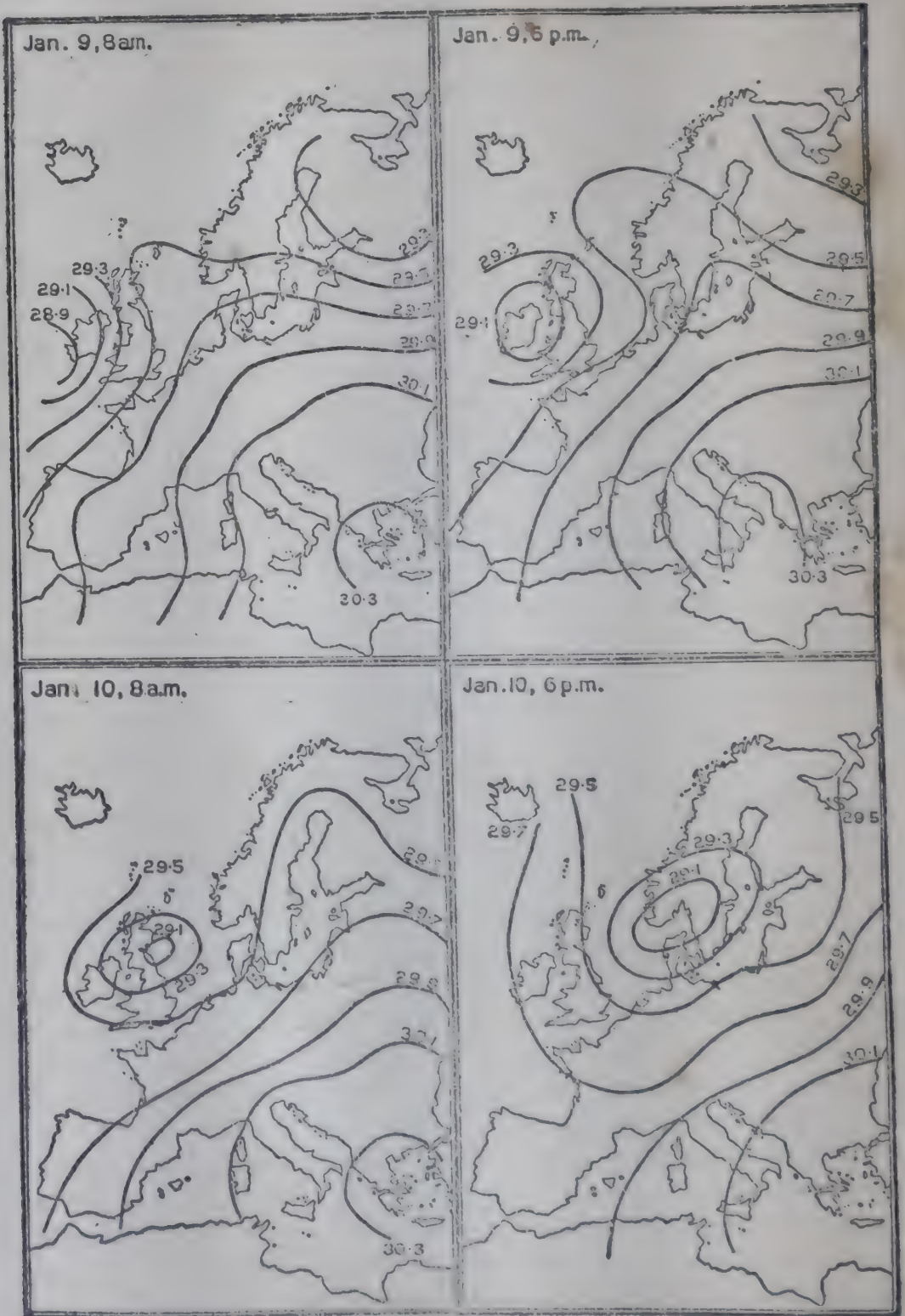


FIG. 45.—CHAPTER XI, EXERCISE 5.

The Northern Plain is bounded on the south by a line running from the southern end of the Caspian Sea to Bering Sea, and is really a continuation of the great European plain. It rises gradually from the south-west to the north-east. The Caspian Sea is 85 feet *below* sea-level; the Sea of Aral is 157 feet above sea-level; Lake Balkash is at an elevation of 780 feet, and Lake Baikal is at an elevation of 1,550 feet. In the south-west part of the lowland is the **Plain of Turkistan**, consisting in great part of formidable sandy deserts, and swept occasionally by an excessively hot wind. East of the Caspian Sea, and north of the Aral Sea, are the **Kirgiz Steppes**, on which the nomadic Kirgiz tribes rear the immense herds of cattle that constitute their chief wealth. The whole of Siberia forms a vast lowland plain. Name any mountains that border it on the south. From the mountains, great level plains, the steppes, stretch to the north, becoming gradually more and more barren as they approach the Arctic Ocean. In the extreme north there is barren tundra, frozen hard in the winter, and thawed into marshes and swamps in the summer. The whole of the northern plain, from the Black Sea to the Arctic Ocean, was once covered by a great sea, of which the Caspian Sea forms a remnant. The sea is shallow, and is gradually diminishing in extent. When it has finally disappeared the climate of this region will be even more extreme than it is at the present time.

The Central System.—The lofty ranges of the Central system radiate from a central knot, the Pamirs. In what directions do the following ranges run: Hindu Kush, Himalayas, Kwen Lun, Tian Shan? The last of these ranges is connected by minor hills and ranges with the **Altai Mountains**. Between the ranges above mentioned lies the vast tableland of Central Asia.

The **Pamir Plateau** is not, properly speaking, a tableland at all, but a series of barren valleys and ridges. The floors of the valleys are higher than the tops of the Alpine peaks, and the summits of the mountains are clad in perpetual snow. "Possessing a mean elevation of from 12,000 to 14,000 feet above the sea, with peaks that rise to 20,000 feet higher, buried deep in snow during seven months of the

year, and often inaccessible for a much longer time, scourged by icy blasts, and devoid of the meanest consolations of life, it is not surprising that the Roof of the World has been generally voted one of its least desirable portions" (Curzon). Towards Turkistan the land slopes rapidly, but on the eastern side it is extended by high ranges of mountains. In summer there is pasture in the valleys, and thither the Kirgiz shepherds lead their flocks. There is a certain amount of through communication by means of these valleys, but the cold on the high passes is so intense, the elevation of the passes is so great, and the country is so barren, that it is unlikely that these mountain roads and tracks will ever become great commercial highways.

The Himalayas ("The Abode of Snow"). The Himalaya range is about 1,600 miles long. In what directions does it run? The system consists of a series of parallel ranges and averages between 100 and 200 miles in breadth. The mountains are in most places practically insurmountable, but access to India from the more northerly lands is possible through certain passes, chiefly in the north-west. At the foot of the range, on the southern side, lies a belt of swamp about ten miles broad called the **Tarai**, the home of numberless wild animals, which live unmolested amongst its fever-haunted recesses. The highest peaks in the Himalayas are Mount Everest, the highest mountain in the world, Dhaulagiri, and Kanchinjanga. Find the heights of these peaks on your map. The Himalayas shelter the plains of northern India from the cold winds of the north, and form the greatest natural boundary in the world. In this mountain-system rise the most important rivers of India, and these rivers have built up a number of great plains with the soil which they have brought down from the mountains. "From the plains, they (the Himalayas) look like a wall of forest, crowned with peaks of eternal snow. Everything we know of mountain scenery is here seen on a gigantic scale. The forests are more impenetrable, the snow peaks more dazzlingly beautiful, the glaciers vaster, the precipices more stupendous, the gorges sheerer and more profound, the roaring rivers which rush through them, between walls thousands of feet in height, more terrific in strength and volume than anywhere else in the world" (Herbertson).

The Hindu Kush form the link between the Central and western systems. Between what river basins does this range form the watershed? Many of the peaks are over 20,000 feet in height.

The Karakoram range contains Mount Godwin-Austen (28,278 ft.), the second highest known peak in the world.

The Tian Shan ("Celestial Mountains").—The system is about 1,500 miles long and consists of a number of parallel ranges. On the western side they fall in a series of terraces. From their snow-capped summits numerous streams flow to the deserts below, where they are ultimately lost. Wherever the streams exist there are regions of great fertility.

The Kwen Lun.—In what direction do they run? Through what country?

Altai Mountains ("Golden Mountains").—This is the most important range in Siberia, but compared with the ranges of mountains in Central Asia it is not of great height. The mountains are rich in gold, and their lower valleys are fertile. Notice the position of the valley of the Irtysh. Here there is a pass which connects Siberia with the land to the south.

Bounded by the ranges we have just been looking at, is the vast tableland of Central Asia, the average height of which varies from 10,000 to 17,000 feet. It is the highest plateau in the world. In the north there are broad valleys of gentle slope, and mountain ridges running east and west. In the south lies Tibet, the highest part of the plateau. In the north-west is the Gobi or Shamo desert, a region of alternate grassy plains and tracts of gravel or sand. On the grassy plains, the Mongol shepherds pasture their herds. This desert was once the bed of an inland sea. It is an area of little or no rainfall, and Lob Nor, lying in the east of the Tarim basin, is gradually drying up as the loss by evaporation is very great.

The ranges and groups of Peninsular India are separated from the Himalayas by the plains of two great rivers. Name these rivers. What mountains separate India from Baluchistan, Afghanistan and Tibet? Notice the position of the Great Northern Plain of India stretching from the Indus to the Mouth of the Ganges, and the southern tableland

of the Deccan which occupies the centre of the peninsula proper. What parts of India would be submerged if the land sank 500 feet? What parts would be scarcely affected?

The following are the chief ranges of mountains south of the Great Plain.

The Aravalli Hills.—In what direction do they run? What two river basins do they separate?

The Vindhya Mountains and the Satpura Hills.—In what directions do they run? What gulf lies near the western extremity of these ranges? What difference do you notice between the elevation of the land north of these ranges and of that to the south?

The Western Ghats.—On which coast do they lie? They rise steeply from the narrow coastal plain but descend gradually towards the plateau.

The Eastern Ghats are a succession of detached hills. Are they, on the whole, nearer to or farther from the sea than the Western Ghats?

The Nilgiri Hills connect the Eastern and the Western Ghats. A gap, running right across the peninsula, lies on the southern side.

Between these mountain ranges lie two great tablelands.

i. **The Northern Tableland**, or plateau of Malwa and Bundelkand. What mountains bound it? On this plateau diamonds are found. The people who inhabit the plateau are more energetic than those living in the lower plains of the Ganges.

ii. **The Southern Tableland or Deccan.**—Name the mountain ranges that bound it. The Deccan slopes from the west to the east. The "black soil" is remarkably fertile, but the rivers are generally too much below the surface for agricultural purposes.

What desert lies on the east of the Indus? It stretches from Baluchistan to the Aravalli Hills. "In its worst portions the desert exhibits a series of sand-hills, divided by valleys in which scanty crops of grain may be reared during and immediately after the rainy season. But the rains are often slight and irregular in their recurrence, and when the intense heat of summer has burnt up the scanty vegetation of shrubs and grass, the fine sand is blown about by the

wind, and hills and valleys shift their places. The whole region then becomes an uninhabitable waste, which only the camel can cross with safety" (*Class Book of Physical Geography*, Hughes).

The Western System is connected by the Hindu Kush with the Central system, and includes the highlands of Asia Minor, Syria, and the plateau of Iran. The central point is Mount Ararat. From this point, ranges run west; north, to the Caspian; south-west, to the Taurus; south-east, and east. The Taurus range connects the Central system with the mountains of Syria, Palestine, the peninsula of Sinai, and the plateau of Asia Minor. South-east of Sinai lie the highlands of Arabia. The Elburz range running along the southern shores of the Caspian Sea is extended eastwards, to form the link with the Hindu Kush, and the outlying parallel ridges of the plateau of Iran curve along the shores of the Persian Gulf and the Arabian Sea, to the Sulaiman Mountains, which descend abruptly to the plain of the Indus.

The Caucasus Mountains.—What seas lie respectively at the eastern and western ends of the chain? The loftier peaks in the range are all above the snow-line, but glaciers are few. The highest point, Mont Elbruz (18,530 feet), is higher than Mont Blanc. There is only one pass, the Dariel Pass, which is practicable for carriages.

The Mountains of Lebanon stretch in a double chain along the coast of Syria. The highest summit is Mount Hermon, which is covered with snow during the greater part of the year. South of Mount Hermon there is a high plateau, intersected by a deep cleft in which lie the Jordan and the Dead Sea. The Syrian Mountains are connected with those of Arabia. Arabia is a vast plateau, with mountain buttresses parallel and near to the coast, from which they are separated by a narrow coastal plain. The interior of Syria is a desert which stretches eastwards to the banks of the Euphrates, and passes southwards into the arid regions which fill the greater part of the Arabian peninsula. In the north-west of Arabia, the desert is one of naked rocks and barren mountain chains, but towards the south there are high plains and immense areas of shifting sand.

The **Elburz Mountains** in the north of Persia skirt the southern shores of the Caspian Sea, and form the northern boundary of the plateau of Iran, which includes the uplands of Baluchistan, Afghanistan, and Persia. The interior of Persia is a plateau with mountain buttresses on the north, west and south. There is low-lying land along the Caspian Sea, the Persian Gulf, and the banks of the Tigris. Part of the interior is known as the Great Salt Desert. In Afghanistan, the plateau of Iran is linked with the Central system by the Hindu Kush. Note how the various mountain ranges connect the Hindu Kush and the Elbruz Mountains. On the east, the **Sulaiman Mountains** divide the plateau from the low-lying plain of the Indus. The **Taurus Mountains** extend along the south coast of Asia Minor, and form the southern border of the steppe-like plateau that fills the interior of the peninsula. The **Mountains of Armenia** have their highest point in Mount Ararat, the mountain on which, according to tradition, Noah's ark rested after the flood.

The Eastern System embraces all the ranges of eastern Asia, from East Cape to Cape Romania, and is really a continuation of the Central system.

Name any of the ranges marked on your map of Asia. What mountains separate the basins of the Lena and the Amur? Between what ranges does the Amur flow? Examine physical maps of the following countries:

Further India.—In what directions do the mountains run? With what system are they connected? What peninsulas do they form in the south? Are there rivers between the mountain chains? Are there plains in the lower parts of these rivers? How do you suppose the plains have been formed?

China.—Speaking generally, in what direction do the mountains of China run? The greater part of the country is mountainous, and, in the west and south-west, many of the high peaks are above the snow-line. In which directions do the rivers run? In what direction does the land slope? Where are there plains? Are the plains associated with great rivers? If so, name the rivers.

Japan.—Are the islands mountainous or flat? In what direction, with regard to the coast, do the chief ranges run?

Several of the highest mountains are volcanoes, and the highest point of all, Fuji-Yama, is an extinct volcano. The islands contain numerous hot or sulphur springs, and suffer from earthquakes.

From Japan to the Malay Archipelago there is a volcanic belt. Sumatra, Java, Flores, and Timor, are all centres of volcanic activity. Between Sumatra and Java lies a little island called Krakatoa. In 1883 the volcano on this island burst into activity. A great deal of the island was blown bodily away and disappeared in the sea. Some of the forests in the neighbouring islands were buried beneath heaps of stones and dust, and new islands were formed in the sea, from the rocks which the volcano hurled from the mainland. The sky was darkened in Batavia, a hundred miles away, while three thousand miles away the noise of the explosions could be heard like the sound of the continual firing of cannon. Enormous waves rushed inland, destroying towns and villages. 36,000 people were drowned. Stones and ashes were shot seventeen miles into the air, and the fine dust was carried all over the earth, causing the most magnificent sunsets that have ever been seen.

REVISION EXERCISES

1. Describe the principle upon which a map of the world is constructed on Mercator's projection. C. J., 1901.
2. Compare Holland with Ireland as to climate, natural advantages, the number of inhabitants, their religion, and their prosperity. C. S., 1892.
3. On a map trace the course of the river Ganges and its principal tributaries, and insert—Calcutta, Bombay, Lucknow, Simla, Delhi, Colombo, Karachi, Peshawar, Plassey, the Vindhya Mountains, the Nilgiri Hills, the Gulf of Manaar, and the Rann of Cutch. C. J., 1896.
4. Mention the mountain ranges surrounding the great plateau which forms the centre of Asia. Name the great rivers rising in them, and state the sea or ocean into which each of them flows. O. J., 1901.
5. What do you know of the Steppes, the Pamirs, the Suez Canal, the Riviera, the North-west Passage, the Sahara? O. J., 1894.
6. On a map mark: the Gulf of Tongking, Formosa, the Malabar coast of India, the Straits of Malacca; the rivers Narbada, Menam, and Si-kiang or Canton; the towns Rangoon, Karachi, Calcutta, and Shanghai. O. J., 1907.

CHAPTER XIII

RIVERS

EXAMINE a physical map of Asia. Notice again the position of the Central Plateau. From this plateau rivers flow in all directions. Those rivers of Asia which reached the sea may be divided into :

- I. Rivers flowing into the Arctic Ocean.
- II. " " " Pacific "
- III. " " " Indian "

But besides the rivers which reach the sea there are a number which flow into inland seas and lakes. These include :

- I. Rivers flowing into the Aral Sea.
- II. " " " Lake Balkash.
- III. " " " Lob Nor.
- IV. " " " Seistan Swamps.
- V. " " " The Dead Sea.

The Aral Sea.—The sea of Aral is disappearing for two reasons. (i) It is slowly evaporating for want of an adequate rainfall. (ii) It is being gradually filled up by the mud brought into it by the rivers. It is so shallow that navigation is dangerous. The depression in which the sea lies is formed of rocks of marine origin, which were laid down in comparatively recent times. They prove that there was once a wide channel from the Arctic Ocean to the Black Sea.

Syr Daria or Jaxartes (1,350 miles).—Where does it rise? Where does it end? In what direction does it flow? Has it tributaries? The water supply for this river is obtained from melting snow. There is practically no rainfall, and at times the river almost disappears. It rises regularly like the Nile, and irrigates many acres of rice fields. What is the largest town in its basin? This town is the political and commercial capital of Russian Central Asia. It is a great trading centre. The surrounding country is fertile, and is noted for the rearing of silk-worms. The cattle of the steppes supply the hides which have given rise to the manufacture of leather.

Amu Daria or Oxus (1,500 miles).—Where does it rise? In what direction does it flow? Has it tributaries? Where does it end? At one time the Amu Daria flowed into the Caspian Sea. It has been known to change its course several times. In its lower waters this river is navigable by small steamers during flood-time. By means of canals it fertilizes the land round Khiva.

Lake Balkash.—East of the Aral Sea lies Lake Balkash, a large inland basin, receiving the Ili and other streams from the northern slopes of the Tien Shan.

Lob Nor.—We owe much of our knowledge of this region to the remarkable explorations of Dr. Sven Hedin in 1899–1902. The lake, choked with reeds, lies in a district which, like the basin of the Aral, is practically rainless, and is uninhabitable except where water can be obtained from the rivers. On the shores of the old lake, Hedin found the ruins of many cities now half buried in the sand. These point to the existence of a once plentiful supply of water.

The Tarim (1,700 miles).—In what mountains does it rise? In which direction does it flow? What mountains enclose the Tarim basin on the north and south? When water fails the river does not flow at all. The course of the dried up bed of the river is then merely marked by lines of tamarisk bushes. Has this river any tributaries? Two important towns stand on the upper waters of the Tarim, where the melting snows feed the river and allow of the irrigation of the land. (i.) **Kashgar**, which makes woollen cloth from the marvellously fine wool that the sheep of the country provide. Where are these sheep fed? Kashgar exports its produce via Khokand, whence it is despatched by rail. (ii.) **Yarkand**, which is fortified and commands the pass across the Karakorum Mountains into Kashmir. Near the town are found deposits of jade, a stone much prized by the Chinese.

The Selatan Swamps.—The Scistan swamps lie in the lowest part of the plateau of Iran. In what country are they situated? The largest swamp—the **Halmand Hamun**—is sometimes spoken of as a lake, but it is really a salty swamp, which, at intervals, is converted into a dry desert basin.

Halmand ("Embanked river").—This river, which depends on glaciers for its water supply, feeds numerous irrigation works. Where does it rise? In what direction does it flow? Through what country does it flow? This country is the most barren part of the plateau of Iran. On the Halmand stands **Kandahar**, the "Key of India," the largest town in Southern Afghanistan, and an important commercial centre, lying on the main route from India to Persia. **Herat** stands on another river that never reaches the sea. What is its name? This river supplies the water that has made Herat the "city of a hundred thousand gardens." Wheat and fruit are grown in abundance. Herat is a trading centre, lying on the great caravan route between Central Asia and India, and is of great strategical importance, because it lies near the only gap in the lofty and continuous wall of mountains that protects the north-western frontiers of India.

The Dead Sea.—Examine a map of the Holy Land. Notice that south of the twin chain of the Lebanon system the country consists of a high plateau region intersected by a very remarkable crack or fissure, in the southern part of which the Dead Sea lies. The surface of the Dead Sea is 1,300 feet below sea-level, and lies in the deepest depression in the world. The sea is so salt that a bather can scarcely sink in it, and fish cannot live in it. On the east and west, the mountains come near to the shores in a series of high cliffs, but on the north and south there are great mud flats. It is now navigated by steamboats, which are provided for the convenience of tourists.

The Jordan.—In the north of Syria the chief ranges are called Lebanon and Anti-Lebanon. South of the Anti-Lebanon range is the lofty Mount Hermon, on the western slope of which the Jordan rises. The hills of Lebanon were once famous for their cedars, but the cedars have now almost disappeared. In fact the whole of the valley in which the Jordan flows has lost its trees. The result is that there are no roots to hold the soil together, the rainfall has diminished, and what was once a "land of milk and honey" is now barren and worthless.

Into what small lake does the Jordan flow north of latitude

33° N. ? This lake marks the end of the first of three stages by which the Jordan descends from the mountains to the Dead Sea. From this lake, the river rushes down the next stage. In what sea does it end ? This sea has clear water and abundance of fish. Between this and the Dead Sea, the distance in a straight line is about 70 miles, but the river winds so much that it travels 200 miles between the two places. Mention any towns in the Jordan valley whose names you have seen in the Bible.

The interest of the Jordan valley, as of Palestine as a whole, lies in the fact that it was the scene of the life of Christ, and later the battle ground of the Wars of the Crusades.

Rivers flowing to the Arctic Ocean.—Name the great rivers that flow into the Arctic Ocean. What happens to these rivers in winter ? What value will the lower portions of these rivers have commercially ? The upper waters are, as a rule, clear of ice for about five months. Notice that the rivers and their tributaries run in such directions that it is possible to travel east and west as well as north and south. When the upper waters melt, the lower parts are still ice-bound. What will happen towards the mouths of these rivers ? What effect will this have on the ground ? The annual rainfall in the northern plains is small, but as the ground is frozen, the loss from filtration is not very great, and as the temperature is low, there is little loss by evaporation. Hence nearly all the water that falls, finds its way to the rivers, and their volume is consequently large.

Ob (2,100 miles).—In what mountains does it rise ? Where does it flow ? What large tributary joins it ? The tributary is longer than the main river. The basin of the Ob is six times the size of France and Germany, and larger than the basins of the three chief rivers of India put together. In parts of this basin there is good grain-growing land. Over 3,000 miles of waterway can be navigated by steamers, and nearly 9,000 miles by barges. The Ob and its tributaries thus form the chief highway of Western Siberia. Tobolsk, on the Irtysh, is the old capital of Asiatic Russia. It has declined in importance since the Trans-Siberian Railway left it on one side.

Yenisei (3,200 miles).—Where does it rise ? What tribu-

tary is received from Lake Baikal ? What tributary joins it near the mouth ? The land between the Ob and the Yenisei is so flat, that the marsh waters flow sometimes into one river, and sometimes into another, according to the wind. British trading steamers have landed cargo at **Yeniseisk**, nearly 1,000 miles from the Arctic Sea.

Lena (3,000 miles).—Near what lake does it rise ? Notice the delta near the mouth. What town stands on the Lena north of 60° N. ? The people of this district are called Yakuts, and they are such keen traders that even a Chinaman cannot beat them.

Goods can be sent down the Ob to its headwaters, and then carried a short distance to the headwaters of the Yenisei. By means of this river and its tributaries, they can be sent to Lake Baikal. From Lake Baikal they can be carried either to the Lena, or to the Amur. Thus the rivers of Siberia provide an almost uninterrupted waterway right across the continent. They have been of great importance to the Russians in their advance eastwards.

Rivers flowing to the Pacific Ocean.—In what directions do the rivers run in : China, Indo-China ? The basins of some of these rivers are amongst the most thickly peopled parts of the earth. All the longest streams rise in the central plateau, and then break through to the sea. They are nearly all navigable, and as they all lie in the region of monsoon winds, they are of great value for irrigation.

Amur (3,000 miles).—In what mountains does it rise ? Between what countries does it flow ? What port is at the mouth ? Most of the upper course of this river is through barren uplands and swamps, but near the mouth there is a fertile area, that is gradually being settled by the Russians. There are steamers on the river, but navigation seawards is much hindered by the bar at the mouth. The Amur is frozen over for six months in every year.

Hwang-ho or Yellow River (2,600 miles).—In what mountains does it rise ? In what direction, and through what countries does it flow ? In what gulf does it end ? About latitude 40° N. it is crossed by the **Great Wall**. This wall, which is made of stone and earth, and faced with brick, is 1,250 miles long, from 10 to 20 feet high, and wide

enough to allow of four horses being driven abreast on the top of it. At intervals there are small watch-towers. The wall goes up hill and down dale, crosses rivers and plains, as though its builders had had the profoundest contempt for all ordinary natural obstacles. It was built to keep out wild tribes from the north-east, and still forms the boundary between China Proper and Mongolia. After passing the Great Wall, the Hwang-ho runs south through a series of gorges. What is about the length of the portion of the river running north and south? In what direction does the river turn to reach the sea? It crosses the Great Plain of China where there are vast deposits of loess, or yellow earth. The depth of this deposit is, in places, as much as 2,000 feet, and the rivers have carved their way through it. The Great Plain is the most fertile area in the world, and never requires manuring. The yellow soil has given to the Hwang-ho the name of the "Yellow River." Yellow is the royal colour of China, and the Emperor of China is the "Yellow Lord." The soil brought down by the Hwang-ho has, in many places, raised its bed above the surface of the land, and the river is therefore embanked for many miles. At times the embankments give way, disastrous floods ensue, and the river changes its course. Until 1852 the river mouth was on the south side of the Shantung peninsula. In that year the banks were broken down, the river took another course, and flowed into the Gulf of Chihli. The estuary of the river moved 300 miles northward. In 1887 another flood caused the destruction of a thousand villages and drowned a million people. The Hwang-ho well deserves its name of "China's Sorrow."

Yang-tse-kiang (3,200 miles).—In what country does it rise? Little is known of it till it reaches the province of Yunnan. This province contains copper and other minerals, and is likely to be of great commercial value in the future. The Chinese have never worked the mines in these distant mountains to any great extent, for they regard the hills as the home of sundry demons and evil spirits. In parts of Yunnan gold dust has been found in the bed of the river. Hence the name, the "River of Golden Sand!" The general course of the Yang-tse-kiang, after leaving

Yunnan, is eastwards. Near what parallel of latitude does it run? Note how the river divides China into two almost equal parts. The river runs for many miles through a series of gorges, with steep lofty walls, crowned with fantastic weather-beaten rocks. Just before crossing longitude 115° E. there is a twin town. Name the two parts. Large steamers are able to reach this point, and from here, by means of tributaries and canals, goods can be distributed in all directions. Coal and iron are found in the neighbourhood, and, under European influence and direction, various steel and iron industries are increasing in value. Hankow is the chief tea market and the future great railway centre of China, and here the river is a mile and a half wide. From Hankow and Wuchang tobacco, opium, rice and hides are exported. Nanking, where the river is four miles (and in flood 20 miles) wide, was at one time the capital of China, and stands in a fertile and densely populated plain. Throughout its lower course the river flows through the Great Plain, in certain parts of which there are 800 people to the square mile. Notice the number of lakes connected with this river. Some of them are of great size and of considerable local importance. The greater part of the basin of the Yang-tse-kiang has a rich red soil upon which large quantities of tea, cotton, grain, mulberry, sugar-cane and rice are grown.

Si-kiang (900 miles).—The chief range of mountains between the basins of the Si-kiang and the Yang-tse-kiang is the Nanling. The soil of the basin of this river is poor, but it is both skilfully and diligently cultivated. Near what important line does this river flow? Name three important places at or near the mouth? To whom do they belong? Through what Chinese province does the Si-kiang flow?

To the Chinese, the waterways are something more than mere means of communication. The people depend on their rivers for the water that fertilizes the plains on which they live in such enormous numbers, and where existence would be impossible for so many people unless food were both cheap and abundant. They get large quantities of fish from the rivers, which thus provide them directly with a cheap and healthy form of food. Thousands of

people live on the waters, in floating houses or in boats. People are born in boats, grow up in boats, and die in boats, and there are more boats in China than in any other country in the world. The children can often swim as soon as they can walk.

The rivers are connected in many directions by canals. The most important of these canals is the **Grand or Imperial Canal**. It was built in the seventh century and is 700 miles long. Find it on your map and note the position of the following towns with regard to it :

Peking, the capital of China. On what river does it stand ? The city is divided into two square walled towns. One of these contains the residence of the Emperor. The two towns are completely surrounded by a wall and a moat. Peking is on a dreary plain, and is troubled from time to time by the dust-laden winds from the west, but its strategic position is an excellent one, as it commands the passes and routes into Mongolia and Manchuria. It is also in the neighbourhood of an abundant supply of excellent coal. What is the port of Peking ?

Ching-kiang is one of the smaller treaty ports, and one of the most important river and canal junctions in the country. On what river is it ?

Hang-chow is another treaty port, at the southern end of the Grand Canal. Navigation seawards is dangerous owing to tidal bores.

What rivers does the Grand Canal connect ? The canal was made to save junks the perilous voyage through the foggy Gulf of Chihli, and the typhoon-swept Yellow Sea ; but the changes in the course of the Hwang-ho have destroyed parts of this old waterway and have made it necessary to take once more to the sea as the means of communication between Peking and the southern provinces.

Mekong (2,500 miles).—What countries does it flow through or separate ? The Mekong is the chief river of French Indo-China. French Indo-China includes Tongking, Annam, Cambodia, and Lower Cochin-China. There is an abundance of mineral and vegetable wealth in the colony, but the low land is unhealthy. The Mekong is

practically unnavigable owing to rapids. The two countries of Cambodia and Cochin-China have been built up by this river, which floods the low country at regular intervals, and so enables the people to raise enormous crops of rice. What port is at the mouth of the river? It is the commercial and political capital of the French possessions in the East.

Menam.—Through what countries does it flow? Into what gulf does it flow? The lower part of Siam is an extensive plain which has been built up by the river, and which produces large quantities of rice. The word “menam” is the Siamese word for “river” and is applied to every river in the country. The true name of the river marked “Menam” on the maps is the “Menam Chau Phya,” or “River Chau Phya.” Near the mouth of the river is **Bangkok**, the capital and chief town. Large steamers when fully loaded, cannot cross the bar at the mouth. They tranship their cargoes into small “lighters.”

Rivers flowing into the Indian Ocean. Salwin.—Into what gulf does it flow? Through what countries does it flow? What port lies near its mouth? This port has a large export trade in teak.

Irrawaddy.—The Irrawaddy is the chief waterway of Burma. Its source was discovered in 1893 by Prince Henri d'Orleans. The River does not rise in the plateau of Tibet, as was supposed, but in some snow-clad mountains in latitude $28^{\circ} 50' N$. In the north, there are ravines with steep sides, where the navigation is impeded by dangerous rapids and whirlpools. The first important town coming south is **Bhamo**, which is near the Chinese frontier. At this point the river is about 500 yards wide. Steamers belonging to the Irrawaddy Flotilla Company connect Bhamo, with the sea.

Mandalay is the old capital of Burma, and contains the palace of the late king, and numerous Buddhist temples. In what direction does the river turn at Mandalay? Notice the size of the Irrawaddy delta. **Rangoon** ships rice, teak, gums and spices, and imports not only European goods for Burma, but also most of those required for the Chinese province of Yunnan.

Brahmaputra (1,800 miles).—Trace this river on the map, beginning at the mouth and going back to the source. On which side of the Himalayas does it rise? What is it called in the upper course? In what direction does it flow? It passes near **Lhasa**, the capital of Tibet. The valley of the Sanpo (the Upper Brahmaputra) is the most thickly peopled part of Tibet, as this is the district where water is most abundant. A certain amount of rain is obtained from the south-west monsoon. Though the north of Tibet is barren and worthless, the south is covered with good soil, and is both well irrigated and well cultivated. Lhasa imports brick-tea from China, and sends wool to China and India. The inhabitants of Tibet are not remarkable for intelligence. The capital swarms with Buddhist priests, mostly ignorant and degraded. One monastery alone contains 10,000 of them. They are called **lamas**, and the chief ruler of the country is the head priest, the Grand Lama. The Sanpo turns south through a mountain gorge under the name of the Dihang, receives from the north the Dibang, and from the north-east the Lohit, passes through Assam as the Brahmaputra, and then reaches the sea by the Ganges delta. In its lower course it is subject to floods, which leave a fertile deposit when they subside. The navigation of the Brahmaputra is rendered very difficult by the force and velocity of the current. The chief product carried by this river is the tea from Upper Assam.

Ganges (1,500 miles).—On which side of the Himalayas does the Ganges rise? The source of the river is in an ice-cave. The river, in its early course, flows through deep gorges and perilous ravines. When it reaches the plains, some of the water is drawn off for irrigation purposes. Floods are common in the valley, and the silt which is deposited enables the farmers to dispense with manure. To the Hindus the Ganges is a holy river, and its life-giving stream is an object of continual worship. The waters of the Ganges can wash away the sins of those who bathe in them, and to die upon the banks is to gain immortal bliss.

What tributary runs in at **Allahabad**? Where does this tributary rise? It is another of the sacred rivers of

India. What tributary runs in at **Patna**? **Patna** is the centre of the opium-growing district, and of a considerable rice trade. Name any large towns on the Ganges or its tributaries. (Most of the chief towns in India will be mentioned in the chapter on "Railways.")

What large river joins the Ganges and helps to form the delta? The delta of the two rivers is known as the **Sundarbans**. It is intersected by fourteen navigable streams, of which the **Hooghly** on the west is the most important, as **Calcutta**, the capital of India, lies on its banks. It is a fertile district where cultivated, but swarms with wild animals, and is exceedingly unhealthy.

Indus (1,800 miles).—Where does it rise? Its source is 18,000 feet above sea-level. The Indus gets its water chiefly from glaciers. In descending to the plains, it has carved out a series of deep gorges. What other large river rises near the Indus? What mountains bound the valley of the Indus in its upper waters (*a*) on the north, (*b*) on the south? Find **Attock** ("Limit"). The Indus is navigable for small vessels up to this point, but as the river is frequently choked with mud, it is of much more use for irrigation than for navigation. What tributary joins the main stream at **Attock**? From what country does it come? What town stands on it? Through what pass does it flow? Name the mountains that lie on the right after leaving **Attock**. What four large rivers unite with each other and the Indus? The five rivers together water the **Punjab** ("The Land of the Five Rivers"). Where do the tributaries rise? Note that from the point where the five rivers are united, right to the sea, there are no important tributaries. Account for this, considering the case of both right and left banks. **Hyderabad** is built three miles from the river banks to avoid floods. In what state is it? The Indus does for this state what the Nile does for Egypt. What port exports the products of the **Indus valley**?

Name the rivers of India flowing into the Bay of Bengal. In what mountains do they rise? Across what plateau do they flow? Through what mountains must they break to reach the sea. They are useful for irrigation, but not for

navigation. Why? Which of these rivers have deltas? Name two large rivers running into the Gulf of Cambay. What mountain ranges bound their valleys? These two rivers are useful for irrigation, and their valleys, as we shall see presently, have been of great value in the construction of the railways.

Euphrates-Tigris.—In what plateau do these rivers rise? Through what plain do they flow? What is the name given to the river formed by their union? The Tigris is navigable as far as Baghdad. This town is in an excellent position for inland traffic, and was once the capital of the Mohammedan world. To-day, though it is dirty, evil-smelling, and half-ruined, it is still the largest city in this region. Beyond Baghdad the river is navigated by means of rafts supported on inflated skins. At one time the two rivers irrigated thousands of acres of land, but under Turkish rule, the canals have fallen into ruin. It is proposed to run a railway down the valley, and in that case the irrigation works will probably be restored.

REVISION EXERCISES

1. Explain the conical projection for making maps and point out its advantages and disadvantages. C. S., 1901.
2. Draw a map of England between the Tyne and the Trent, showing the coast and chief rivers, shading the high lands and naming the Aire Gap, Shap Pass, the Peak District, the Lake District, and the York Wolds. L. J. S., 1907.
3. Draw a map of the Ganges and its tributaries, marking and naming the chief towns on the banks of the river and its tributaries. C. S., 1906.
4. Describe the river system of India. On what rivers are the following towns: Ailahabad, Benares, Delhi, Jubbulpore, Lahore? C. S., 1896.
5. Describe the importance of the Nile, the Yang-tse-kiang, the Danube, and the Irrawaddy to the countries through which they flow. O. J., 1899.
6. On a map of India mark the Malabar coast and the Nilgiri Hills, and the rivers Mahanadi, Godavari and Tapti. Show the positions of Nepal and Kashmir, and of the towns Madras, Patna, Lahore, Bombay and Agra. O. P., 1907.

CHAPTER XIV

THE COAST

EXAMINE a map of Asia, and note the position of the Caucasus Mountains. Between what two continents do they form a boundary? Find the western extremity of the range. In what sea is it? In what direction does the coast of Asia run from this point? The country we are passing belongs to Russia and is called Trans-Caucasia. In what direction does the coast bend about longitude 40° E.? Of what peninsula does the Black Sea wash the northern shores? Would you expect these northern shores to be high and rocky, or low and flat? Why? Can you see any evidence pointing to the existence of good harbours? By what strait does one pass from the Black Sea to the Sea of Marmara? The strait is narrow, and has lofty wooded shores, on whose banks many fine oriental mansions are to be seen. What sea is entered after passing through this strait? By what channel do you pass from the Sea of Marmara into the *Ægean* Sea? In its narrowest part the channel is not more than a mile wide. Both sides are strongly fortified, and Turkey had the right, up to her defeat by the Allies in the Great War, to refuse a passage through the strait to the warships of any nation. Is the west of Asia Minor indented or not? The Gulf of Smyrna is forty miles long and there is deep water right into the heart of the City. Notice the fringe of islands along the coast, the inhabitants of which are of queer descent. Most of the Islands are fertile. All are subject to earthquakes. The chief industry of the inhabitants is sponge-fishing. Some of the islands are of considerable historic interest. Chios is one of the places that claims the honour of being the birthplace of Homer. Antony and Cleopatra lived on Samos, and St. John wrote "The Book of Revelation" on Patmos. In ancient times the island of Rhodes was celebrated for its "Colossus," one of the "Seven

Wonders of the World." This Colossus is said to have been a gigantic figure of bronze, ninety feet high, that stood near the entrance to the harbour.

In what direction does the coast run between Rhodes and Iskanderun? What mountains are near the coast? Would you expect the southern shores of Anatolia to be rugged? Why? What island is crossed by latitude 35° N.? To whom does it belong? It is inhabited chiefly by Greeks. The lower parts of the island are very fertile, and the climate, though dry, is in most parts healthy. The chief occupation of the inhabitants is agriculture, but there are small manufactures of Turkish leather, silk and cotton goods. Amongst the mountains copper is obtained. What is the capital of the island? Name any ports that you can see.

The waters in the eastern part of the Mediterranean are called the "Levant." "Levant" is an Italian word meaning "the East." In what direction does the coast of Syria run? What mountains lie behind it? The coast is regular and there are no large harbours.

What canal must we pass through to get out of the Mediterranean Sea? What port stands at the Mediterranean end of the canal? Here steamers take in coal. The journey through the canal is slow and monotonous. The sand wastes on either side are devoid of vegetation, and the air is at all times hot and stifling. What town stands at the southern end of the canal? On what gulf does this town stand? On leaving the gulf, what sea is entered? In ancient times this sea was a great commercial highway, and was connected with the Nile by means of a canal. When the Cape route to India was discovered, the Red Sea became of less importance, but since the construction of the Suez Canal, it has again become one of the leading commercial highways of the world. Are there any rivers running into the Red Sea? Is the Red Sea in a hot or cold region? Will the evaporation of the water be great or little? Will the Red Sea be very salt?

From the peninsula of Sinai to the Strait of Bab-el-Mandeb the shore is fringed with coral reefs and islets, which make the navigation dangerous, but the mid-channel is open and deep. Behind the Arabian coast rise the buttresses

of the plateau. Off Jiddah there are valuable banks of black coral.

What strait connects the Red Sea with the Gulf of Aden ? The name means "the Gate of Tears." In the narrowest part of the strait there is a small island belonging to Great Britain. Name it. What British possession is on the south coast of Arabia in longitude 45° E. ? It somewhat resembles Gibraltar, being a mass of rock rising up from the sea and connected with the mainland by a narrow sandy isthmus. **Aden** is of great value as a coaling station and fortress, but it is a very unpleasant place in which to live. It is situated in the crater of an old volcano and is walled in by precipices. The heat is tremendous. There is no water supply in the town. Drinking water is obtained by condensing sea water, and is bought and sold in the markets. The market-place at Aden is usually crowded with laden camels, bringing in the produce of the surrounding country.

In what direction does the coast run beyond Aden ? What islands lie off the coast ? To whom do they belong ? The southern coast of Arabia is very regular, and possesses few good harbours. On what gulf does Maskat stand ? What is the gulf called when it narrows ? Into what gulf does the strait lead ? The Persian Gulf is of great political importance and contains a portion of the submarine cable which connects Europe and India. The Strait of Ormuz is only about 50 miles wide, and is nowhere more than 50 fathoms deep, so that in time of war, an enemy in possession of the Gulf could easily destroy the cable. To whom do the Bahrein Islands belong ? They are the centre of a flourishing pearl industry. The eastern waters of the Persian Gulf are too deep for pearl fishing. What river runs into the northern end of the gulf ? Is there a delta ? Does this point to the probability of the gulf ever being filled up ?

The southern shores of Persia and Baluchistan are barren. What delta lies between longitude 65° and longitude 70° ? What port stands on this delta ? What opening lies south of the delta ? The greater part of this district is a salt-encumbered waste in the dry season, and a vast shallow

sea about three feet deep in the wet season. South of the Rann of Cutch there is a fertile peninsula. What gulf lies between the peninsula and the mainland? What two rivers run into the gulf?

The only really good harbour in India is at **Bombay**. South of Bombay, what mountains lie behind the coast? Is there any coastal plain? If so, is it narrow or wide? What name is given to the west coast of India? Notice the position of two groups of islands in the Arabian Sea.

- (i) The Laccadive Islands. They are composed of coral.
- (ii) The Maldive Islands, also composed of coral. They export the products of the coco-nut.

What large island lies off the south of India? What gulf separates it from the mainland? In this gulf there are important pearl fisheries. When the gulf narrows what is it called? Notice the chain of small islands connecting Ceylon with the mainland, and known as Adam's Bridge. The island and the mainland were once completely connected at this spot. The passage across the bridge is difficult and dangerous for ships, for even at high tide there are but few places where there is a depth of more than three or four feet of water. Steamers passing from Bombay to the Bay of Bengal sail round Ceylon. Their port of call is **Colombo**, which has a spacious and well protected harbour. The coast beyond Colombo is everywhere lofty and well wooded inland, but flat and covered with jungle at the water's edge. What is the eastern coast of India called? It is flat, sandy, uninteresting, and dotted here and there with coco-nut palms. There is no natural harbour at **Madras**, but an artificial one has been constructed, which is, however, only kept clear and in repair at an enormous expenditure of time and money. What mountains would be seen while sailing along the Coromandel coast? What rivers enter the sea between Madras and Dacca? The delta of the Ganges is a wild swamp called the Sundarbans. It has been built up from the soil brought down from the mountains by the rivers. The chief channel through the delta is the River Hooghly. This estuary is of very considerable width and has low jungle-covered banks. There are innumerable channels in other parts of the delta,

some of which are fairly deep, but they are so narrow that the rigging of a ship is often caught in the branches of the trees, and they all swarm with crocodiles. In the forests that cover the Sundarbans tigers and other wild animals abound. In what direction does the coast run after leaving the Ganges delta? What country is coasted? Find Cape Negrais. It is the seaward projection of a mountain ridge which is covered with valuable timber. Where does this ridge originate? What flat land is there between Dacca and Cape Negrais? In what direction does the coast turn at Cape Negrais? What delta is passed? The shores of the delta are low and sandy. Into what gulf does the Salween flow? What is the name of the narrow province that runs south? This province is celebrated for its teak forests. Notice the various islands fringing the coast.

What islands lie between latitude 10° N., latitude 15° N., longitude 90° W., and longitude 95° W.? These islands are volcanic, and covered with dense tropical forests. They are used by the Indian Government as a convict settlement. The chief settlement is on the splendid natural harbour of **Port Blair**. Farther south are the fertile Nicobar Islands, which are also used as a convict settlement. Both groups belong to the British.

What strait lies between the Malay Peninsula and Sumatra?

Penang is on an island. It is one of the group of British possessions known as the Straits Settlements. The capital of the island is Georgetown. Penang is the centre of a large coasting trade, and exports large quantities of tin. What province is on the mainland opposite Penang? It belongs to the British, and grows spices and rice. At the end of what peninsula does Singapore stand? Singapore has a magnificent harbour, but the island on which the town is built is low, damp, and unhealthy. Singapore, which commands the Straits of Malacca, the entrance to the China Sea, and the entrance to the Java Sea, is an absolutely free port, and more than fifty lines of steamers meet there.

From Singapore the coast runs north again. What gulf is there on the east of the peninsula? Name a river running into this gulf, and the country it flows through. Near

its mouth stands **Bangkok** the capital of Siam. This city is threaded with canals, and is called on that account "The Venice of the East." Thousands of people live entirely on the water in floating houses and in house boats. The chief exports from Bangkok are teak and rice.

What cape is crossed by longitude 105° E. ? In what country is it ? What river has a delta in latitude 10° N. ? What is the largest town on the delta ? Along the coast of Cochin-China and Annam there are few places of importance. What gulf lies to the north of Hué. Hué is the capital of Annam. What river runs into the gulf ? **Hanoi** is the capital of Tongking. It was once a seaport, but the river has deposited so much silt that Hanoi is now 80 miles inland. What large island lies on the east side of the gulf ? What strait separates the island from the mainland ? **Hong Kong** is another British possession. It is an island. The capital is Victoria. Hong Kong is a most valuable possession, for it stands as it were at the gate of China. It was once a very unhealthy place, but the planting of trees, and the construction of an efficient drainage system, have converted it into quite a healthy district, though the climate is at all times hot. In 1841 the island was occupied by a few fishermen and pirates. To-day it is the greatest trading place on the coast of China. Large quantities of cotton goods are received for the use of the Chinese, and in return there are exports of tea, silk, and hemp.

What river reaches the sea near Hong Kong ? At the mouth is **Maçao**, a Portuguese possession of no commercial importance at the present time. **Canton**. On what river ? This is the largest city in China, and one of the largest in the world. About how far is Canton from Hong Kong ? Canton has a safe harbour and excellent water communication inland. At one time it was the only port in China open to foreign trade. It became, and still remains, the chief silk port of China. Over a quarter of a million people live in boats or floating houses. The land part of the town is picturesque but very dirty.

What island is crossed by the Tropic of Cancer ? This island was taken from the Chinese by the Japanese in the war of 1894-5, and renamed by them **Taiwan**. On

the west the ground is fertile, and produces rice, sugar, tea, and hemp. In the centre and the east there are dense forests of camphor laurel. The island also possesses mines of coal, sulphur, and other minerals. The chief ports are **Kilung** in the north, and **Tainan** in the south-west.

What strait lies between Formosa and the mainland? Just north of latitude 30° N. is one of the large openings in the Chinese coast. It is named after the town which stands at the head of it. What is this town? Just beyond the northern extremity of the bay lies **Shanghai**, the busiest of the treaty ports, as it is the outlet for the fertile and densely populated valley of the Yang-tse-kiang. This river brings down quantities of mud and is gradually filling up the harbour at Shanghai. Cotton is grown near the port, and as labour is cheap, the cotton industry is a flourishing one.

What sea is north of Shanghai? What peninsula projects into it from China? Is this peninsula mountainous or low? What peninsula bounds the sea on the east? Is it mountainous? What gulf is on the north of the Shantung peninsula? What great river runs into it? At the mouth of what river does **Tientsin** stand? This port is the port of **Peking**, with which place it has rail and river communication. **Port Arthur** formerly belonged to the Russians, but was surrendered by them to the Japanese in the recent war between these nations.

The shores of Corea are rugged, for the peninsula is mountainous. The mountains are covered with thick forests. The chief port is **Chemulpo**, which was opened to foreign trade in 1883. Notice the large number of islands fringing the coast. On reaching the southern end of the peninsula we turn north and pass through Corea Strait. What islands lie on the east? Name the four largest. What islands connect this group with Formosa? What sea lies between Japan and the mainland? What island runs north-west to the mouth of the Amur? What islands connect Japan with Kamchatka? Would you expect to find cliffs on the east coast of Siberia? Why?

Returning to the Sea of Japan, notice the position of **Vladivostok**, on a deep, safe harbour. In winter the bay is frozen over and ice-breaking steamers are used to keep a

clear passage for ships. Vladivostok is the Russian terminus of the Trans-Siberian Railway.

Japan has a long coastline and many good harbours, of which the chief are Tokio Bay and the Gulf of Osaka.

The climate of Asia north of Sakhalin is one of great extremes, and it is no uncommon thing in the winter to see icebergs stranded on the shores of this island. The northern part of Sakhalin belongs to Russia, and is used by them as a convict settlement. The southern part of the island now belongs to Japan. What sea lies between the mainland and Kamchatka? About October this sea freezes over. What cape terminates Kamchatka? What islands lie off the east coast? What sea lies north of these islands? What strait separates Asia from America?

The north coast of Asia is flat and dreary, and unfrequented by ships, as it is blocked with ice except during a few weeks of summer. Name the ocean that washes the north shore, and the rivers that flow into this ocean.

Examine a physical map of Asia, and note the variations in the width of the continental shelf. Which of the islands are "continental," and which are "oceanic?" **Wallace's Line** is a line drawn N.N.E., passing between the islands of Bali and Lombok (see map of East Indian Archipelago), and Borneo and Celebes, marking the separation of the continental shelves of Asia and Australia. Through what straits does it pass? It was named after the biologist Wallace, and possesses a certain scientific importance that will be best realized after reading the chapters on "Vegetation" and "Animals."

REVISION EXERCISES

1. Give some account of the chief effects of ice on the earth's surface.
O. J., 1888.
2. Mention the limits of the basins of the Tay. Name in order from north the south the counties on the right bank of the Shannon. C. J., 1890.
3. Draw a map to show the position of the Himalayas, the Caucasus, the Atlas Mountains, the Niger, the Yang tse-kiang, Lake Nyasa, the Kara Sea, Spitzbergen, Bering Strait, and St. Helena.
4. Describe the course of a steamship voyage from Suez to Port Arthur, giving the chief British possessions that would be touched at or passed on the way.
C. J., 1906.
5. Mention the chief natural features, political divisions, towns, and anything of special interest that would be passed on a coasting voyage from Karachi to Hongkong.
C. J., 1906.

CHAPTER XV

CLIMATE

THE continent of Asia extends through so many degrees of latitude, that every possible variety of climate can be experienced within one portion or another of its vast extent. Fig. 46 shows the isotherms for January. What is the difference between the hottest and the coldest isotherm? Between what isotherms does India lie? China? Japan? Remembering that the temperatures as given by the isotherms have been "reduced to sea-level," and that the temperature falls 1° F. for every 300 feet of ascent, what is the average January temperature on the summit of Mount Everest? Compare this map with the map of Asia in your atlas, and say what rivers are likely to be frozen over in January. In which direction do the isotherms bend, and why?

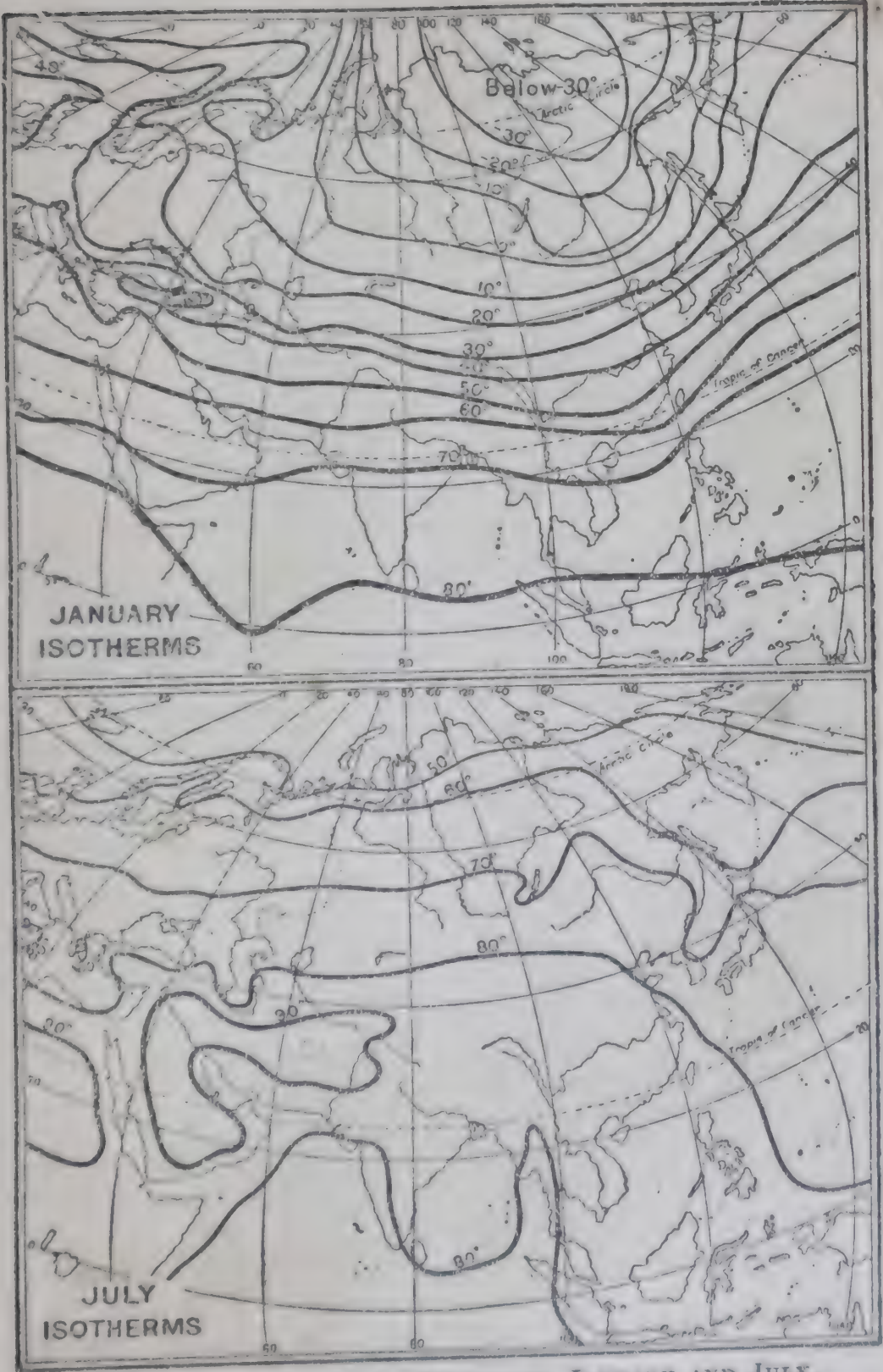
Fig. 47 shows the July isotherms. Answer any of the above questions that can be applied to this map. Answer also the following questions: Which is further south, Ceylon or the centre of Arabia? Which is the cooler in July? Account for this. Trace the isotherms 80, 90, and account for their irregular character.

What countries of Asia have (a) a purely maritime climate, (b) a purely continental climate, (c) different kinds of climate in different parts?

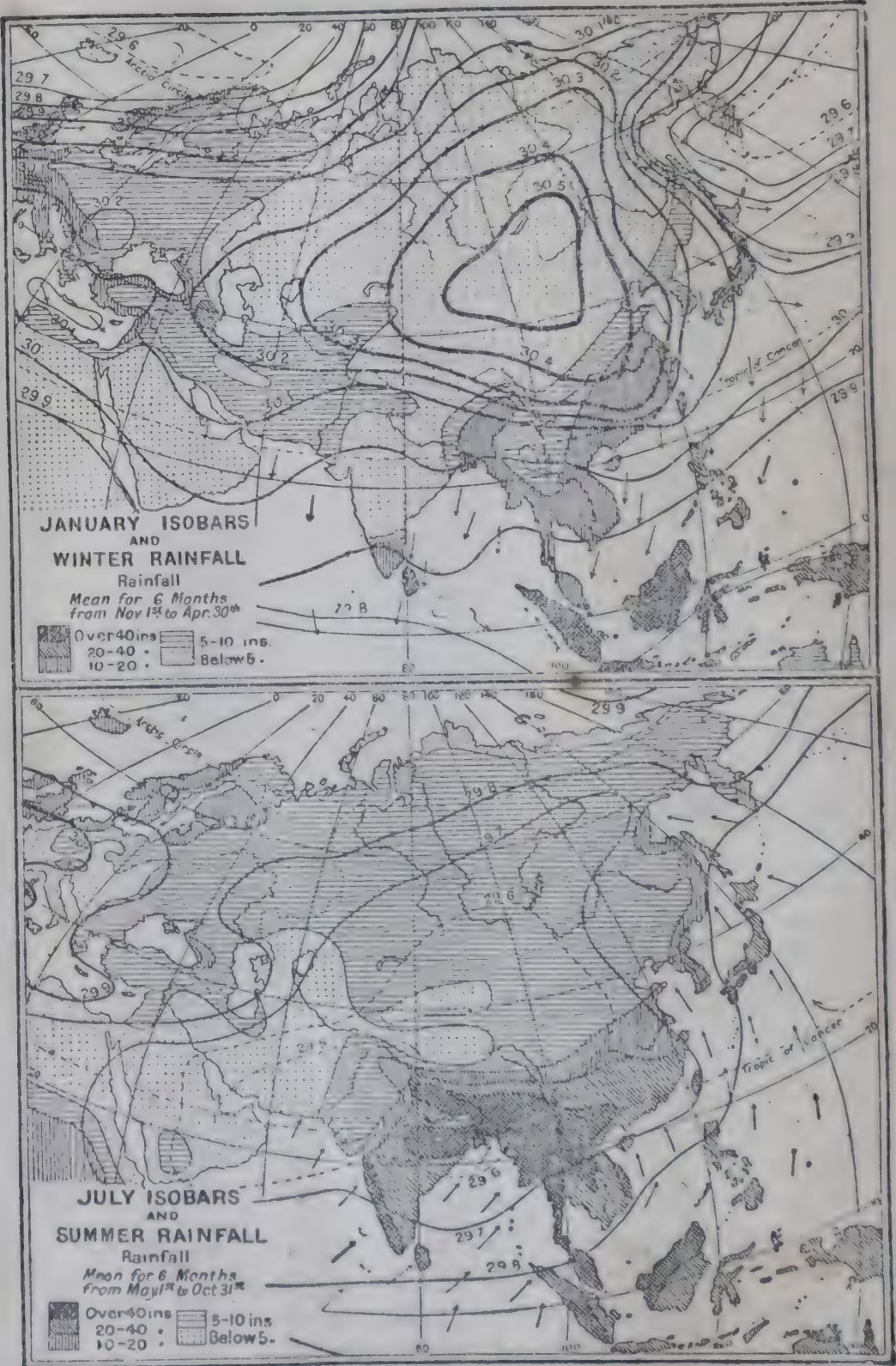
Fig. 48 shows the isobars for January. Where is the area of highest pressure? Is this an area of high or low temperature? In what directions do the winds flow? Will these be dry or wet winds?

Fig. 49 shows the isobars for July. Whereabouts do isobars 29.9, 29.8, 29.7 lie? In which directions will the winds blow? Are they wet or dry winds?

Notice the enormous differences of temperature that exist due to differences in latitude. The north of Asia is in the Arctic Circle, while the south is near the Equator. Then there are equally enormous differences of temperature due



FIGS. 46 AND 47.—ASIA: ISOTHERMS, JANUARY AND JULY.



FIGS. 48 AND 49.—ASIA : ISOBARS, JANUARY AND JULY AND WINTER AND SUMMER RAINFALL.

to differences in elevation. Some parts are at sea-level, while the summit of Mount Everest is almost six miles above it. The land is so compact, that many places are far from the sea, and therefore suffer a climate of great extremes. Refer to the map you made in Chapter XI, and notice how much of the continent is over 500 miles from the sea.

Rainfall.—Fig. 50 shows the mean annual rainfall for Asia. Make a list of those parts of the continent having a rainfall, under 10 inches, from 10 to 20 inches, from 20

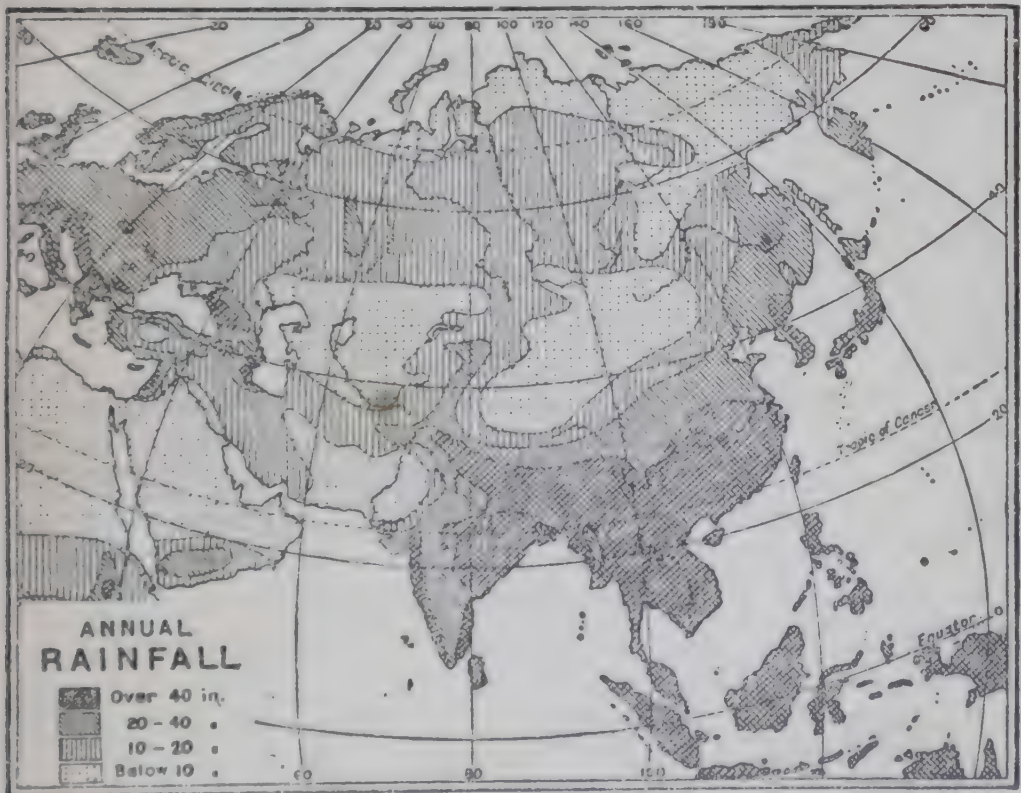


FIG. 50.—ASIA : MEAN ANNUAL RAINFALL.

to 40 inches, and over 40 inches. Account for the dry areas. Which are the driest coasts? the wettest? What hills cause the precipitation of rain? From what oceans do the wet winds blow?

There are at least seven distinct climatic areas in Asia.

I. The Arctic Area.—This is the cold dry area of the extreme north. What river estuaries does it contain? What is the annual range of temperature?

II. The Siberian Area.—Is this likely to have a

climate of extremes or an equable climate? Why? Siberia slopes to the north, that is, away from the sun. How does this affect the climate? Are there any mountains to shelter this area from the cold northern blasts? How does this affect the climate? Is Siberia on the whole a wet or a dry country? Near the east, where ocean winds are experienced, there is an area of moderate rainfall. Verkhoyansk, in the winter, is about the coldest place on earth, and the thermometer sometimes registers 131° of frost. At the same place, in July, the temperature will rise to 102° F., that is to the temperature of a tropical country. During the winter Lake Baikal is frozen over with ice many feet thick, and cold dry winds from this dismal area flow N.W., N., and N.E., over the rest of the continent.

III. The Monsoon Area includes the Indian Empire, the Indo-Chinese peninsula, China, and Corea. (For the climate of the islands of the Malay Archipelago, and of Japan, which are usually classed with the above countries as the Monsoon Lands, *see* VII.) The term "monsoon" is applied to these countries on account of the monsoon winds which blow over them at regular intervals.

The monsoons are caused in the following ways: (a) When the sun is north of the Equator, the central portions of Asia get, during the long hot days, heated to a very high temperature. The air over the heated land expands and rises. Air rushes in towards the area of low pressure thus created. The winds that blow are heavily charged with moisture, and when, laden with vapour, they strike the mountain slopes, they deluge the adjacent lands with rain. The average rainfall in certain parts of the Western Ghats is over 200 inches. "As the rain-bearing clouds strike the crags of the Western Ghats, the thunder begins to rumble, the whirlwind bursts over the land, the lightnings flash incessantly, the rain is discharged in tremendous down-pours. Then the black clouds are suddenly rent asunder, the light of day gradually returns, and of the banked-up masses of storm-clouds, nothing remains except some fleecy vapour ascending the valleys or drifting over the tree-tops" (Reclus). The south-west monsoon sweeps across India, but in Assam is deflected to the south-east by the Himalayas.

Here, in the Khasia Hills, there occurs one of the wettest regions in the world, the rainfall averaging 600 inches. Explain why the Thar desert, which lies in the track of the south-west monsoon, has so little rain.

(b) In winter the land cools, and an area of high pressure is developed, giving rise to dry out-flowing winds, the north-east monsoon. As this wind sweeps across the Bay of Bengal, it becomes a wet wind, and carries an abundant supply of moisture to the east coast of southern India. What mountains cause the precipitation of the rain in this case ?

India may be said to have a **hot season** from March to June ; a **rainy season** from June to October, when the south-west monsoon blows ; and a **cool season** from November to March, when the north-east monsoon blows. During the hot season the European residents retire to the hills. The chief hill stations are Darjiling and Simla in the north, and certain parts of the Western Ghats and of the Nilgiri Hills.

When the monsoons change, violent storms occur, which are called **Cyclones** in the Indian Ocean, and **Typhoons** in the China Sea. These storms have a circular character. As the air rushes towards the area of low pressure it gets deflected from a straight path by the rotation of the earth. The result is that the wind whirls round and round, often with great rapidity. Such a storm, like a spinning top, has two motions, one forward, along a definite path, and another of rotation. North of the Equator the rotation is in the contrary direction to that of the hands of a watch. South of the Equator it is in the same direction as the hands of a watch. "Previous to the outbreak of a great storm, the weather is generally fine, cloudless, but very hot, with a high barometer. Dark clouds gather together, and the storm commences. At first it comes on as a moderate wind, gradually increasing in force as the centre approaches. Then, when the storm appears at its height, there is a dead calm which may last probably an hour. After this the wind is renewed with all its former violence, but the wind blows now in an opposite direction owing to the rotation of the cyclone. Finally the storm dies away as gradually

as it came, and once more the weather is clear. After some of these hurricanes the scenes presented to the eye are nothing but ruin—houses blown down, trees up-rooted and shorn of their branches—nothing but desolation all round.

“During the passage of the storm there is usually a heavy fall of rain. When the cyclone passes over the ocean, in the centre where the pressure is least the water of the ocean is heaped up, and when it approaches the land it is hurled inland with terrific force, carrying all before it” (*Earth-Knowledge*).

Indo-China is in the tropics. What kind of climate will the low-lying parts experience? Notice that this region lies in the track of both monsoons. How does this affect the rainfall? Is the Malay Peninsula likely to have an equable climate or one of extremes? Why?

China lies on the east of the largest land mass in the world. How will this affect the climate of its western provinces? On the other hand, it is exposed on its eastern borders to the monsoon winds from the sea. How does this affect the rainfall? Through how many degrees of latitude does China extend? What differences in climate will this cause between the northern and southern parts?

IV. The Intermediate Area of the Central Plateau.—Is this a dry or a wet region? When the north winds blow over the plateau, do they bring rain or not? Why does this area receive little or no rain from the southerly winds? Would you expect a “continental” climate? If so, why? Owing to the great elevation, the summers are much less hot than they would be if the land were lower. The winters are, for a similar reason, much more severe. In Tibet, the cold during the winter is almost unbearable, and blinding snow storms are frequent. The intense cold of these months has destroyed most of the vegetation, and has helped to convert the land into a desert.

V. The Mediterranean Area.—Between what parallels of latitude does Asia Minor lie? To what kind of climate does this point? Is the interior (*a*) far from the sea? (*b*) high or low? How will this affect the climate? In Syria and Palestine most rain falls in the winter. Why? After the winter rains there is a short spell of dry weather

followed by a further period of rain. After this a long dry season ensues, lasting from the middle of April to the middle of September.

VI. The Hot Deserts of the Southern Peninsulas.—Trace the desert belt on the map and name its several parts. Between what isotherms does Arabia lie in July? What is the mean annual rainfall? Sometimes no rain falls for three or four years. The absence of rain accounts for the absence of rivers. The narrow belt between the coast and the plateau is in all parts intensely hot and arid, but it is of course cooler, though equally dry, on the higher land. Persia suffers from extremes of climate. Why? There is a fertile well watered strip along the southern shore of the Caspian Sea. Account for this. Why does the plateau of Iran get little rain from the south-west monsoon?

VII. The Islands.—The climate of the different islands varies with the latitude. Would you expect great heat in the East Indian Archipelago? What influences tend to moderate the heat? Is the rainfall heavy or not? Japan has a climate resembling that of Great Britain, but Peking, on the mainland and farther removed from the influence of the sea, has a winter as cold as that of Stockholm, and a summer as hot as that of Cairo. The annual range of temperature in Japan does not exceed 40° F. What warm current flows along the east coast? There is a cold current flowing south past the Kurile Islands. When these meet fogs are produced. Which of the Japanese islands will have abundant fog? Notice that the mountains traverse the islands more or less parallel to the coast. They thus condense the moisture brought by the winds from the south-east. They also prevent the cold winds from Siberia from reaching the east coast.

REVISION EXERCISES

1. Write a brief description of the weather in the Shetlands, the English Channel, the South of France, the Baltic Sea, as indicated in figure (Fig. 51). State where the wind is strongest and where it is calm. Shade the area in which you would expect to find rain. L. J. S., 1907.

2. Where is iron found in Britain? Which are the chief iron manufacturing centres? Near which of these iron manufacturing centres is shipbuilding carried on? Are there other reasons for this besides the nearness of a supply of iron? L. J. S., 1907.

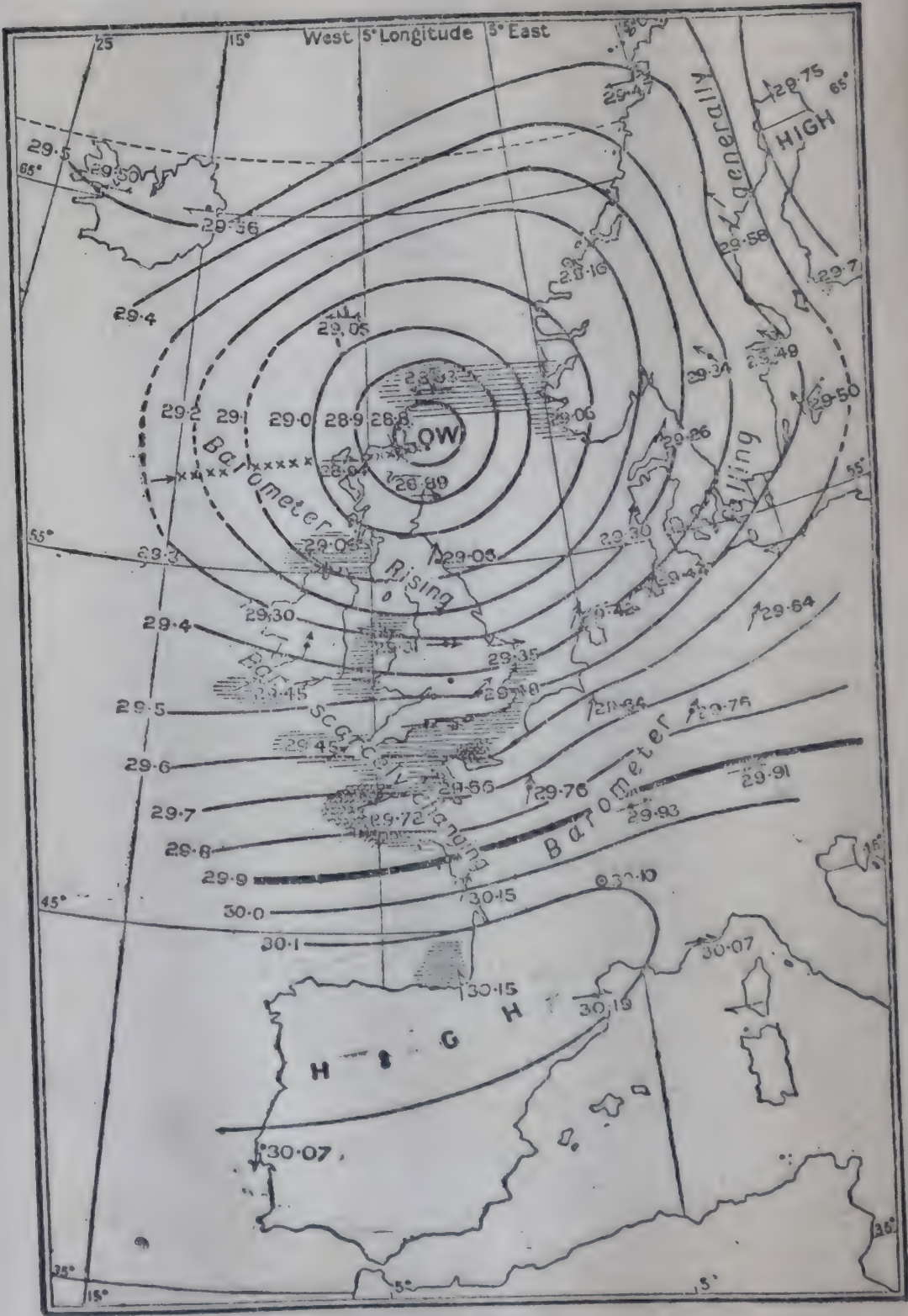


FIG. 51.—CHAPTER XV, EXERCISE 1.

3. Draw a map showing the chief rivers and mountain systems, with their names, of the area drained by rivers flowing through China. Mark and name three towns on the coast.
L. J. S., 1907.

4. What is a monsoon wind? Explain the south-west monsoon of India. Draw a sketch map to show to which parts of Asia it brings rain.
L. J. S., 1907.

5. The fifty-second parallel of north latitude passes through or near the following places; describe and account for the differences in climate between them: Cambridge, Irkutsk, Newfoundland, Lake Winnipeg, Vancouver Islands.
C. J., 1888.

6. Describe and account for the positions of the chief regions in Asia which suffer from deficient rainfall.
O. S., 1907.

7. Explain fully why places in the monsoon region usually receive most of their rainfall during the summer.
O. J., 1907.

CHAPTER XVI

VEGETATION

EXAMINE the map showing the distribution of vegetation in Asia (Fig. 52).

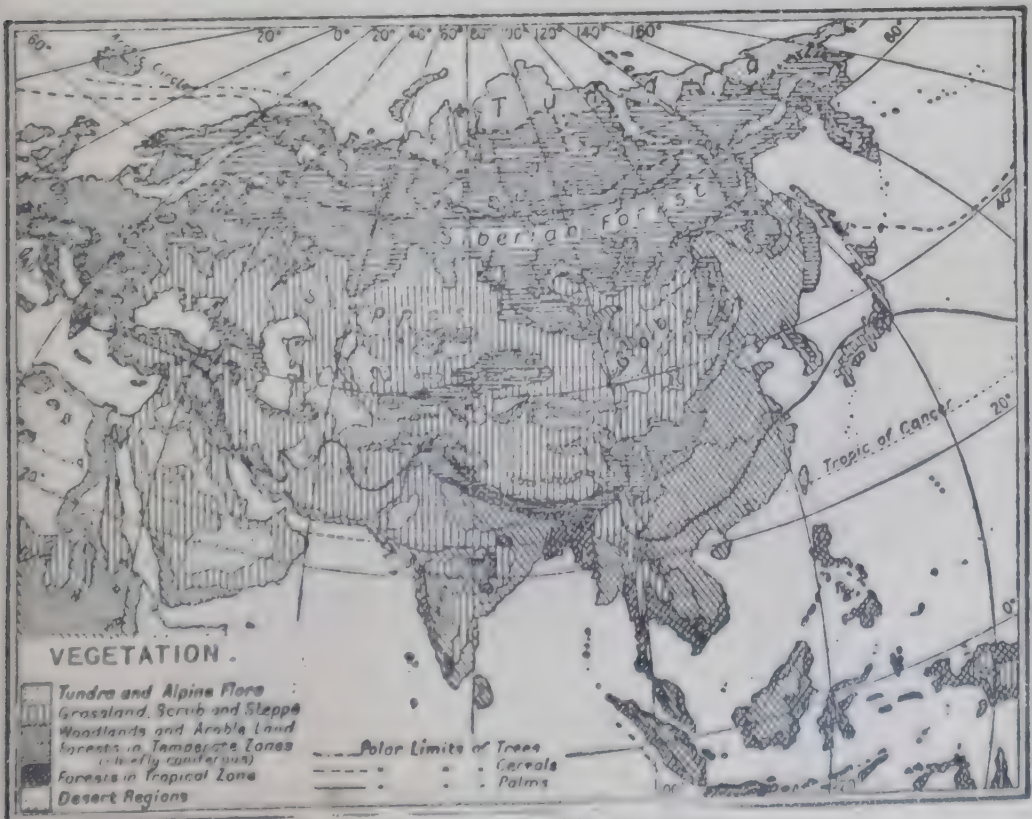


FIG. 52.—ASIA : VEGETATION.

There are seven typical areas of vegetation in Asia, which correspond in the main with the seven climatic areas, for the climate of a country determines what kinds of plants will grow in that country. Find these areas, as given below, on Fig. 52, and also on the map of Asia in your atlas.

I. The Tundra.—This is a broad belt of inhospitable desert. In the winter it presents the appearance of a dreary waste of ice and snow, and the ground is frozen to a depth of several feet. There is a short summer during which the ground is thawed. When the thaw comes, much of the surface is turned into a moss-covered bog, but two feet below there is still solid frozen ground. At this time many brightly coloured flowers burst into bloom. The summer is hot enough but not long enough to ripen grain. Trees cannot grow owing to the intense cold of the winters. The dwarf-birch, a shrub about three feet in height, is able to withstand the Arctic cold, and various berry-bearing bushes, such as the cranberry, crowberry, and whortleberry, are common. The tundra region extends from the Arctic Ocean to about latitude 63° N. The average January temperature is 35° F. below zero.

II. The Siberian Forest-area (63° N. to 55° N.).—This is one of the temperate forest areas. It stretches from the Urals to the Amur and contains tracts of forest that are larger than some of the smaller countries of Europe. Much of the interior of this extensive region has not yet been explored. It is only when the ground is frozen, and the rivers covered with ice, that the fur hunters can penetrate into some of its recesses. On the northern edge of the forest belt the chief tree is the larch. This is followed by deciduous trees, of which the birch is the commonest. Owing to the fact that frequently only one kind of tree is to be seen for miles, the general aspect of the country is monotonous. In the lowland round the basin of the Ob the soil is fertile, and as the trees afford some shelter from cold north winds, wheat can be grown, but farther east, both the height of the land and the extremes of climate are so great that agriculture is unprofitable.

III. **The Steppes** lie south of the forest zone, and, including the desert portions, cover the whole of central Asia from the Caspian Sea to Manchuria. A steppe is a dry and extensive tract of soil in which large trees will not grow, owing to extreme dryness and great changes of temperature. Some of the steppes are comparatively fertile; others are sterile regions. Some are endless plains; others are undulating; and others again are mountainous. On the edge of the forest area they are covered with grass, and provide excellent pasture land, while on the edge of the actual desert there is no vegetation except during the short wet season. The rivers of the steppes get their water from the snow-covered mountains that lie to the south, and wherever there is a constant supply of water there is great fertility. In April the snows melt in the valleys and on the lower slopes of the mountains and the soil gets moistened. Hundreds of beautiful bulbous plants, such as tulips and lilies, which have managed to defy the winter cold, burst into bloom.

IV. **The Hot Deserts of the South** resemble those of Africa and may be regarded as an extension of them. They owe their existence to the absence of an adequate water supply, for in the winter the Tropic of Cancer is a belt of calms and no rain falls, while in the summer the heat rapidly evaporates any moisture that may reach these thirsty lands. The days are very hot and the nights are very cold. The difference between the mid-day and mid-night temperatures is so great that the alternate expansion and contraction of the rocks, due to these sudden changes of temperature, has resulted in the disintegration of the rock, and the consequent formation of sand. As there is no vegetation to hold the surface together, the sand is distributed in all directions by the wind. The surface of a desert is not flat, but more or less undulating. The typical plant, wherever water is to be found, is the **date-palm**. The only true desert plants are those which can exist on little water or have means of storing up portions of what they obtain. Such plants include frankincense, myrrh, gum-arabic, and senna.

Arabia is too dry to possess luxuriant vegetation, but

wherever there are oases, the date-palm flourishes. In the south-west, the Turkish province of Yemen enjoys a comparatively temperate climate. The highland portion of the province grows coffee, fruit, vegetables, coco-nuts, palms, and bananas. Yemen is the true home of the coffee. The coffee plant is an evergreen shrub, with shiny leaves and snow-white flowers. The beans are small and greyish green. The first crop ripens in May, and a second and even a third are often obtained in the course of a year. In the south-east, the mountainous parts of the native state of Oman are cool and healthy, and the coast-belt is fertile and well cultivated.

V. The Mediterranean Region resembles the south of Europe.

The coast regions are warmer and damper than the interior, and produce olives, figs, oranges, lemons, and peaches. In the drier interior, wheat is grown, and on the mountain slopes there are pines, cedars, myrtles, and evergreen oaks. Under better government Asia Minor might be one of the gardens of the world. With Asia Minor may be included Syria, Palestine, Armenia, the greater part of Mesopotamia, parts of Transcaucasia, and Persia. All these places have a climate somewhat resembling that of the south of Europe, warm, dry summers, mild winters, and winter rains; but the southern part is much hotter and drier than the north and passes into the desert lands. In the valley of the Euphrates and the Tigris, the chief product for export is dates. The soil of this region, when watered, is remarkably fertile. With practically neither ploughing nor manuring, the grain which is sown yields not one, but several hundred-fold. The coasts of Syria are open to the wet winds and grow vines, olives, oranges, wheat, and tobacco. Behind the coastal plain are the hills that attract the rain. Towards the north these hills are densely wooded, but in Palestine the forests have been for the most part carelessly destroyed.

Footnote.—For other remarks on the vegetation of the Mediterranean region see the chapters on vegetation in Part I, Europe, and Part II, Section 2, Africa.

On the dry plateau of Iran there is scanty vegetation. But in the irrigated valleys opium, wheat, tobacco, and roses are grown. In Persia and Afghanistan mulberry trees are grown for the feeding of silkworms. One of the most fertile portions of this area is on the slopes south of the Caspian Sea, where the abundant rains allow of dense forests, and where wheat, barley, rice, cotton, and sugar are grown.

VI. The Monsoon Area is characterized by great heat and abundant moisture, and therefore by luxuriant vegetation. The kind of vegetation varies very much in the different parts of the monsoon area, as there are very considerable differences of latitude and altitude. The products of the north of China and of Japan closely resemble those grown in the cool lands of the other continents, while in India rice, sugar-cane, indigo, and opium are grown. And in India itself, though the low-lying plains produce a wealth of tropical plants, yet cotton, tea, wheat, barley, and European vegetables are cultivated on the sides of the hills. Forests of timber trees are plentiful, and there is, in fact, practically no temperate or tropical plant that cannot be grown in some part or other of the extensive and fertile monsoon area. Many of the plants are indigenous, but some, like coffee and cinchona, have been introduced from other lands.

The seven main crops of India are millet, rice, wheat, cotton, oil-seeds, indigo, and sugar. **Millet** is the staple food of the people of India, though rice is the more abundant crop. The best wheat, maize, and barley, come from the cool regions of the North-West Provinces and the Punjab. The grain is exported from Karachi. Although the monsoons bring water at fairly regular intervals, yet they occasionally fail, and then drought, famine, and death ensue. To mitigate the disasters caused by the want of water, the Indian Government has constructed great irrigation works. **Cotton** is grown in the same places as the wheat, but it grows best on the rich black soil of the Deccan. It is the most important fibre of the monsoon area. **Flax** is grown on the banks of many of the rivers. From the seeds linseed oil is obtained. The castor-oil plant is

also cultivated for the sake of the oil that can be obtained from the seeds. **Jute** is grown in the delta of the Ganges. From its fibres, rope, sacking, and coarse cloth are made. **Coffee** flourishes in Madras.

The chief grain grown in all the monsoon regions is **rice**. The seeds are sown in wet ground, and sprout in about a week. Three or four weeks later the young plants are transplanted into the "paddy-fields." The fields are completely under water, and are simply masses of mud. They require very careful weeding, and this is an unhealthy, and by no means an easy task, as the labourers are at all times knee-deep in the water. As water is so important in the cultivation of rice, the plant can only be grown in the low-lying deltas, or in plains that are flooded or can be adequately irrigated. Canals and trenches have often to be constructed to secure flooding at proper times, and to proper depths. In most places at least two crops a year can be obtained. Near the rice fields in China large crops of sugar-cane are grown, and the banks that divide the fields from one another and prevent the water running away are generally well cultivated also. The Chinese are amongst the best farmers in the world. Their farms are very numerous, and so small that they look more like gardens than fields.

Indigo is grown in India round the Ganges and in the Punjab. The plants grow to a height of between three and four feet. When they are about to flower they are cut down, tied in bundles, and then steeped in water. When fermentation sets in, the liquid is placed in other vats and whipped with bamboo sticks. When the beating begins, the liquid is yellow, but it afterwards turns green, and then flakes of indigo appear. After the water has been run off, a sediment of indigo is found at the bottom of the vat. This is pressed into cakes ready for the buyer.

The **tea** shrub requires a fair supply of moisture, iron, and vegetable refuse in the soil, and a slope steep enough to prevent moisture settling round the roots. It flourishes in the south of India, on the Western Ghats and the Nilgiri Hills, and in Assam, Ceylon, and China. Indian teas are superior to Chinese teas, and are largely used for flavouring

them. At one time the chief product of Ceylon was coffee, but in 1869 the plants were destroyed by a fungus, and the planters turned their attention to other things. Of the many new plants introduced by the planters tea was one of the most successful, and now Ceylon tea is as well known as Chinese tea. The shrub grows to a height of about three feet. The leaves are plucked all the year round, chiefly by women and girls, who put the young leaves and the little leaf-buds into a basket and take them to a tea factory. The leaves, etc., are allowed to dry naturally, are then rolled, and finally are dried or baked. After this they are sifted by means of a huge sieve into various qualities. The best consists of the little leaf-buds; the next quality includes some of the young leaves; while the coarser leaves form the third and cheapest quality. In China the seedlings are reared with great care, and are planted out when they are four to five inches high. At the end of the third year the plants are picked. They afterwards yield three harvests a year. The leaves are first dried in the sun, and are then trampled under foot in the factories by men and women, in order to get rid of moisture. The best Chinese tea is exported to Russia via the Siberian railway. As it has to be conveyed to the rail by means of camels, it is necessary to pack it as small as possible. The leaves are ground, steamed, and then compressed into brick-shaped blocks. In this form it is exported as "brick-tea," and is used by the Mongols as money, a brick being worth about sevenpence halfpenny. The Thibetans drink tea all day long, and are very fond of a mixture called "buttered tea," made of stewed tea-leaves, rancid butter, and barley-flour. The monsoon lands produce nearly all the tea in the world.

The opium poppy is grown in India in the Ganges valley, the centre of the area being at Patna. The seeds are sown in November and the flower appears in February. When the flowers are ready to drop off, the pods are cut, and the juice oozes out. This juice is scraped from the plants and put in earthen jars. The jars are handed over to Government officials, who superintend the refining of the crude product. The opium is sold by auction in Calcutta, and is exported chiefly to China, though some is sent to Europe

for use as a medicine. The chief opium-growing district in China lies between the River Yang-tse-kiang and the Nanling Mountains. The Chinese product is used for the adulteration of that obtained from India. Opium is smoked by the Chinese partly to deaden pain in time of great suffering, and partly as a pleasant form of intoxication. The after effects are, however, very terrible, and after a certain time the habit grows upon the smoker to such an extent, that he consumes large quantities of the fatal drug and becomes a physical and moral wreck. So great is the injury to the nation that the Chinese Government is taking steps to reduce the consumption of the poison.

Cinnamon is an important product of Ceylon. Ceylon is one of the richest areas of vegetation in the world. Not only has it all the plants and trees of the south of India, but it possesses about 800 species of its own. Cinnamon is a kind of laurel. The dried bark is used as a spice, and a sweet-smelling oil is obtained from the fruit, leaves, and roots.

Most of the hills in the monsoon regions are clothed with forests in which grow many trees that are of great use to mankind. The most valuable of these forest trees is **teak**, which is obtained chiefly from the forests of Indo-China. The wood is hard, yet easily worked, and is not attacked by termites ("white ants"). It contains an oil which prevents any nails or bolts that are driven into it from rusting.

The largest of the Indian trees is the **banyan** or Indian fig. There is one well known tree that has 350 trunks, and the whole group measures 2,000 feet in circumference. The **coco-nut palm** is carefully planted and tended in Ceylon, where the people say that it cannot grow far from the sound of the human voice. It is probably a native of the South Seas and grows well on islands, as it needs a sandy soil near the sea. One tree will bear fruit four or five times a year, and will live from seventy to eighty years. The flesh of the nut is eaten; the milk is drunk both in the natural state and as a fermented liquor called **arrack**. The shells are used for cups and bowls, the fibres are plaited into mats and fabrics, the leaves are used for thatching, and the stems

play an important part in the building of houses and boats.

The **bamboo** is another useful plant. Its hollow stem is used for every purpose from building houses to furnishing pipes for supplying water or even gas. "China would not be China without the bamboo."

Many kinds of fruit are grown in the monsoon region, but in Japan the orchards are not very productive because the rains of autumn fall just when hot air and sun are needed to ripen the fruit.

VII. The Tropical Islands have not only great heat and moisture, but these conditions are constant, and the islands support all forms of plant life that require constant warmth and rain.

The most important food-plants are the sugar-cane, sago-palm, coco-nut, and breadfruit.

Sago is obtained from the pith of the sago-palm. The yield is so great that a month's work will produce twice as much sago as the native needs for a year's supply. He can, therefore, feed himself easily, and also provide a large quantity for export. The **breadfruit** tree is almost as important as the coco-nut. Six breadfruit trees will support a family.

The most important spices are pepper, nutmeg, and vanilla, and the most important fibre is tobacco.

On the Asiatic side of Wallace's Line the chief trees are the palm, the bamboo, and other trees similar to those found on the mainland of Asia. On the side of the line towards Australia there is the eucalyptus, and other trees similar to those of Australia. The most important trees in the densely-forested island of Sumatra are the gutta-percha tree and the camphor-laurel. This island exports black pepper, maize, sago, camphor, gutta-percha, and tobacco.

Below are given the chief vegetable products of the different countries of Asia. Take each country and examine the list of products, noticing how these products are influenced by rainfall, temperature, etc.

Siberia. — Wheat, pine, birch, larch, berry-bearing plants.

Russian Turkistan.—Wheat, rice, cotton, hemp, flax, tobacco, apples, pears, plums, peaches, apricots, grapes, pomegranates, melons.

Caucasus.—Rice, wheat, maize, millet, peaches, apricots, cherries, oranges, citron, vine, mulberries.

Asia Minor.—Barley, cotton, grapes, olives, figs, turpentine (from the pine trees).

Armenia and Kurdistan.—Cereals, tobacco, cotton, grapes, melons.

Mesopotamia.—Dates.

Syria and Palestine.—Vine, olives, figs, oranges, mulberries, dates, tobacco, cedar.

Arabia.—Cotton, durra, myrrh, frankincense, gums, balsam, senna.

Persia.—Wheat, barley, rice, cotton, sugar, madder, indigo, tobacco, opium, silk, grapes, figs.

Afghanistan.—Wheat, maize, rice, cotton, sugar, tobacco, grapes, melons, apples, pomegranates, assafœtida.

Baluchistan.—Fruit.

India.—Teak, coco-nut, date-palm, sandal-wood, deodar, india-rubber, banyan, tamarind, mango, ebony, bamboo, plantain, millet, pulse, rice, opium, cotton, indigo, sugar-cane, tobacco, jute, wheat, tea, pepper, coffee, cinchona,

Ceylon.—Tea, coffee, cinchona, cacao, cinnamon, tobacco, rice.

Malay Peninsula.—Rice, tapioca, pepper, cloves, sugar, nutmegs, sago, gambier, coffee, dye-woods, gutta-percha.

Siam.—Rice, cotton, tobacco, sugar-cane, coffee, fruit, teak.

French Indo-China.—Rice, gamboge, resin, dyes, spices.

Malay Archipelago.—Spices, sago, gutta-percha, coffee, rice, sugar, tobacco.

China.—Wheat, barley, maize, millet, rice, cotton, sugar, opium, tea, mulberry.

Japan.—Rice, barley, rye, wheat, sugar-cane, mulberry, tea, bamboo, camphor tree, lacquer tree, wax tree.

Rewrite the above list of plants, etc., taking them one by one and saying where each is grown, thus:—

Wheat.—Siberia, Russian Turkistan, Caucasus, etc.

REVISION EXERCISES

1. Vladivostok is in nearly the same latitude as Marseilles. Explain the difference in climate. C. S., 1905.
2. A number of seaports in the British Isles are used as calling places by ocean-going mail steamers. Name and describe the positions of *two* such ports, and explain fully why they are so used. Describe the routes connecting the ports you name with London. O. J., 1907.
3. In what parts of Asia are there (1) deserts, (2) grasslands, (3) forests? Illustrate your answer if you can by a sketch map of the continent. What connexion is there between rainfall and the places where forests are found? L. J. S., 1905.
4. Two of the great agricultural products of India are *wheat* and *rice*. Describe the general position of the chief regions producing these crops and compare their climates. O. P., 1906.
5. What are monsoon winds? Where, when, and from what directions do they blow? What parts of Asia receive rain from the monsoon winds? L. J. S., 1906.
6. India produces valuable timber trees. Name the chief kinds. What are the woods chiefly useful for? Where are the principal forests? O. P., 1907.

CHAPTER XVII

ANIMALS

WE are indebted to Asia for nearly all our domestic animals and for all our poultry, with the exception of the guinea-fowl and the turkey. The introduction of animals into Europe, from the west and the south-west of Asia, was at all times an easy and a common matter. Owing to the absence of barriers between the various parts of northern Asia, and between northern Asia and northern Europe, typical animals are widely distributed over the northern areas of both continents. But where there are high mountain ranges, or deserts, these have divided the continent into areas in which the fauna of one area differ very much from the fauna of another. In considering the distribution of animal life in Asia we shall find it convenient to divide the continent into three large regions.

I. The Northern Plain.—Here are found fur-bearing animals, such as the Polar bear, Arctic fox, wolf, and sable. The characteristic animal of the Tundra is the reindeer, which inhabits dry, cold, low-lying land areas, and is the only animal that can be used for transport purposes

over the frozen marshes. It is heavily built, has short legs, and is trained to drag sledges across ice and snow, its spreading hoofs ensuring a sure foot-hold on the slippery surface. Its broad hoofs also enable it to cross the bogs that are formed in the summer. The reindeer provides the dwellers in the Tundra with milk and meat, and with skins for clothes and for tents. The Arctic fox has, in summer, a brownish fur of the colour of the rocks amongst which it lives, but in winter the colour of the fur changes to white, the colour of the snow. These changes in colour serve to protect the fox from the attacks of the larger and more powerful animals of the same region. Protective colouring is common among wild creatures in all parts of the world. Wild geese are plentiful on the Tundra, and whales frequent the northern shores. In the southern forest area of the plain, the fur-bearing animals are squirrels, foxes, and bears. At one time the ermine, beaver, and sable were common, but they have been so recklessly hunted that they are now quite rare. The stag, weasel, wolf, grouse, partridge, and hazelhen are also found in the south of this region.

II. The Central Tableland is the home of the wild ass and the camel. The camel is the most useful animal in the steppes and deserts. It can exist on a scanty supply of food and water. It can store up water in a special chamber of the stomach, and food in the form of fat in the hump. The feet have pads which can expand to prevent the animal sinking into the sand, and both the nostrils and the eyes can be closed at will, in order to protect them from the violent sandstorms that rage in the desert. The most useful camel in Central Asia is the Bactrian or two-humped camel, which will eat the salty and bitter plants of the steppes. It has longer hair than the ordinary camel, and owing to its shorter legs is a better climber.

Central Asia is the home of most of our domestic animals, such as the horse, ass, sheep, and goat. **Sheep** are plentiful on the dry plateau of Iran. Persian carpets are made from their wool, while their skins are used for the manufacture of sheep-skin coats. In India sheep are reared on the dry hills of the north-west.

Goats can live in drier and more rocky regions than

sheep. The Angora goat is found on the dry heights of Asia Minor. Most of the beautiful Kashmir "wool" is not wool at all, but "mohair" from goats.

Cattle are found on the steppes. They supply the wandering tribes with milk, meat, clothes, tents, and rugs. In India the people, for religious and climatic reasons, are almost vegetarians. Amongst such a people milk is an important article of food. Horned cattle are used for ploughing and for transport, but they are not killed, as they are held sacred amongst the Hindus.

The yak corresponds to the camel and the reindeer as a transport animal. It lives in the dry, cold uplands, and can endure the greatest privations amongst the snows of the Himalayas, and the cold deserts of Tibet. The yak is a low, heavily-built creature, with large and massive horns. Over its sides hangs a mass of long black hair, forming a kind of fringe. This animal is very sure-footed, and can travel twenty miles a day over rocks and ice. Butter is made from its milk; ropes and tent-coverings are made from its long hair.

Horses are found in the steppes. They are more dependent on water than the camel, but as the flocks and herds of the shepherds are of enormous size, the horse is invaluable. Without it the nomadic tribes would be unable either to tend or to protect their flocks. Arabia is the home of the Arab horse, as well as of the Arab camel and the Arab donkey. The finest breed of Arab horses comes from Nejd, but the largest stocks are found on the plains near the Euphrates. The Arab horse is handsome in appearance, fearless in spirit, and very swift of foot; but even in Arabia itself the camel and the dromedary are more important than the horse, as not only are they adapted for transport purposes in places where horses are useless, but they are valuable for their milk, hair, and flesh. The beautiful large white Arab donkey is ridden only by people of high rank.

III. **The South and South-East.**—Of the three regions this is the richest in animal life. In the jungles and forests are the elephant, tapir, and rhinoceros, several kinds of wild ox, tiger, leopard, orang-outang, cobra, python, and crocodile.

The elephant is the most useful transport animal throughout the monsoon area. It is found in the damp forests on the hills of the north-east of India, on the Malabar coast, and in Indo-China. The Asiatic elephant is the only elephant now used for domestic purposes, and when it is hunted, is rarely hunted to death. Herds of wild elephants are driven into an enclosure, and then the most suitable animals are sorted out, to be trained to work. The others are set free. Tame elephants are used both in the capture and in the training of their wild brothers. In Siam and Burma they are of great value in connexion with the teak industry. When the trees are cut down, the elephants roll them into the streams, and assist in placing them together to form rafts. When the rafts arrive at the saw-mills the elephants lift and stack the logs. The so-called "white elephant" gave to Siam the name of the "Land of the White Elephant." This animal is, however, not white at all, but of a dirty brown colour, with lighter patches due to a skin disease. It was formerly worshipped in Siam with much ceremony. Although still held in great respect as the possible earthly abode of a god, it is no longer treated with an excess of superstitious affection.

In the many forests of the mainland and of the islands in the monsoon region every kind of animal life is to be found, from the huge elephant to a tiny beetle, and both by day and night the forest is filled with the ceaseless noise of birds, beasts, and insects. A magnificent species of tiger, noted as a cattle stealer and a fierce fighter, is found in the Bengal forests and in the forests of the Brahmaputra. Another species lives far from homes of men. It is more fleet of foot than that found in Bengal, and also more cowardly. It will run away from man, and will attack him only in self-defence. There are jackals in all parts of India, and wild dogs in Assam. One of the greatest animal pests in the hot lands is the cobra, a snake about five feet long and six inches thick. Its bite is so poisonous that 20,000 human beings and 60,000 cattle are killed by cobras every year. Few people ever recover from the effects of the bite, and the Indian Government has offered a very large reward to any one who shall discover an antidote for snake poison.

Amongst the smallest but most valuable of creatures in the monsoon area is the **silk-worm**, which is reared chiefly in China and Japan. The worms are reared in all parts of China, from the north to the south. In the centre and south they are fed on the mulberry, but in the colder north, where the mulberry does not flourish, they are fed on a kind of oak leaf. The female worm lays a number of tiny eggs. These are taken to warm rooms and artificially hatched. The young worms are fed on chopped leaves which they devour ravenously. They grow very rapidly for about a month, and then they spin round themselves a kind of silk cradle, or **cocoon**. The cocoons are heated and the worms destroyed. If this were not done, the worms would change into moths and destroy the silk, as they ate their way out of the cocoons. The cocoons are steeped in boiling water, and the silk unwound by women and girls. For many years the Chinese tried to keep the secret of the manufacture of silk to themselves, and it is said that the first eggs that came to Europe were smuggled over in a bamboo cane. In Japan, the weaving of silk into beautiful fabrics is one of the most important industries of the country.

Fish.—In China there are 40,000,000 people who make their living by fishing, a fact which strikingly illustrates the importance of the fishing industry in that country. All the rivers of Siberia are full of fish, as is also the fresh-water lake, Lake Baikal. In Kamchatka the rivers swarm with salmon. It is said that every one lives on salmon, even dogs, bears, horses, and cows. At times the salmon enter the rivers in such quantities that the water overflows the banks.

Below is given a list (for reference only) of the chief animals of each of the countries of the continent. Rewrite this list to show in what countries each animal may be found.

Siberia.—Sable, fox, marten, ermine, squirrel, bear, fat-tailed sheep, yak, camel, reindeer,

Russian Turkistan.—Camel, horse, sheep, cattle.

Asia Minor.—Buffalo, camel, Angora goat.

Mesopotamia.—Sheep, cattle, horses.

Arabia.—Camel, horse, sheep, goat, donkey, lion, leopard, panther, jackal, wild boar, ostrich, locust.

Persia.—Lion, goat, pheasant, horse, Persian cat, fat-tailed sheep.

Baluchistan.—Camel.

India.—Elephant, tiger, wild ox, buffalo, camel, leopard, wild cat, bear, hyena, wolf, jackal, wild dog, wild hog, sheep, goat, monkey, peacock, jungle-fowl, parrot, vulture, pigeon, python, cobra, locust, termite ("white ant").

Malay Peninsula.—Tiger, elephant, rhinoceros, buffalo, bear, monkey, snakes, birds of brilliant plumage.

Indo-China.—Elephant, rhinoceros, tiger, leopard, wild boar, crocodile, buffalo, ox, horse.

Malay Archipelago.—Tiger, elephant, rhinoceros, wild ox, orang-outang, cockatoo, bird of paradise, cassoway.

China.—Silkworm.

Japan.—Silkworm.

REVISION EXERCISES

1. At Yakutsk the average temperature in January is 45° F., the average in July is 70° F.; at Colombo the average in January is 80° F., and in July 81° F. What circumstances tend to produce such contrasts in a climate as this?

Explain the following terms: tropic, mistral, snow-line, steppe, trade-winds. C. J., 1890.

2. State and explain some of the ways in which the position of Great Britain has helped the growth of her manufacturing industries. O. J., 1907.

3. Draw a map of Asia, shading the high land (say over 3,000 feet), showing the course of four of the most important rivers, and inserting and naming a town on each. Write "rainy" across the rainiest parts of the continent. L. J. S., 1905.

4. Explain carefully the phrase *tropical products* and name six of the most important. O. J., 1897.

5. (a) What animals furnish furs of commercial importance, and in what regions are they found? (b) Mention the chief fishing-beds of the world. O. S., 1895.

[An encyclopædia will be found useful in answering a question like 5.]

CHAPTER XVIII

MINERALS

THE mineral wealth of Asia is enormous, but it is largely in a very undeveloped condition. The people of Asia are chiefly shepherds and agriculturalists, and their wealth

consists in flocks, herds, and crops. In most places little trouble has been taken to utilize the vast stores of minerals that are scattered throughout the continent, and where mining operations have been carried on, they have generally been both originated and directed by Europeans. Even India, although in the possession of a race which has devoted much of its energy and talent to manufactures and mining in other parts of the world, still depends for its prosperity on the produce of the fields and the forests. The Malay Peninsula has stores of tin, petroleum, coal, rubies, and sapphires, but the mines are worked with little skill and energy, except by the British in Burma and the Malay Peninsula, and the Chinese in a few of the other states.

Gold is most abundant in the north-east. The deposits of gold in the Altai Mountains, and in the basin of Lake Baikal, are very rich. This part of Asia belongs to the Russians, who will probably extensively develop the mines, especially as the Trans-Siberian Railway now affords them a convenient and speedy means of transport, both for men and minerals. Transport in some cases is obtained by means of the Yenisei and its tributaries. The ground in this district is often frozen so hard in the winter that fires have to be employed to thaw it before the gold-bearing earth can be dug out for washing. The grains of Siberian gold are very large, and several of the nuggets that have been found have weighed as much as a quarter of a pound.

Coal is most abundant in China, Japan, India, Hainan, Sakhalin. China possesses the largest deposits of coal in the world. There are five valuable coalfields. Mark these and all the other coal-bearing areas on a blank map.

1. In the south-east of Shansi Province. In the basin of what river? The anthracite coal found here is of very excellent quality. Shansi has also supplies of iron, limestone, and potter's clay.

2. South of Hunan. The coal obtained in this field can be sent via the Siang to the Yang-tse.

3. Szechwan. Here the coal crops out by the roadside, and the children go and hack off pieces for use in cooking at home.

4. North-east of Tientsin, worked on European methods, with railway connexions.

5. The Shantung peninsula.

The coal mines of China are but little worked. As has been remarked, "Coal is not mined in China. It is scratched."

Japan has coal deposits both in Hokkaido and Kiushiu. The presence of coal has greatly assisted the development of the Japanese railways. Half the coal obtained is used at home. The other half is exported to Hong Kong, Shanghai, Chefoo, Newchwang, and Singapore.

Tongking and Annam have coal which they export to Hong Kong and Singapore and even to San Francisco.

In India enough coal is produced to supply the railways of the country.

The chief coalfields are as follows:

(i) The Narbada valley.

(ii) Raniganj and the hills of Chota-Nagpur.

The coal from these two fields is used on the railway line from Bombay to Calcutta.

(iii) The Punjab.

(iv) Godavari valley.

This supplies the coal for the railway line from Bombay to Madras.

(v) In the hills of the north-east of Assam.

The coalfields in this district are rather small but the coal is of excellent quality.

Tin is the chief mineral found in the Malay Peninsula and the Malay Archipelago, where it is mined chiefly by the Chinese. Three-fifths of the world's supply of tin come from this peninsula.

Petroleum is found in the Malay Peninsula and Archipelago, Burma, Upper Assam, Sumatra and Caucasia. At Baku there are hundreds of petroleum wells. Everything there smells and tastes of petroleum. The oil is exported westward via Batum, eastwards to Krasnovodsk, and northwards to Astrakhan.

Salt.—In many places on the sea coast this is obtained by evaporating sea water. In the deserts and in the areas of inland drainage, where the loss of water by natural evaporation is greater than the gain from the rainfall, salty

lakes and marshes are found. Salt occurs in layers of rock-salt in India, and is mined in the Salt Range in the north-west of the Punjab.

Precious Stones.—Ceylon has supplies of sapphires, rubies, moonstones. The only other mineral of any value found in this island is graphite. Rubies are found in Burma, diamonds in India, and jade in Turkistan. Most people in the monsoon lands invest their surplus money in jewelled ornaments. They do not put their wealth into banks. They wear it on their bodies.

In Japan **copper** and **antimony** are found, and are largely used in the making of metal ornaments. The **sulphur** from the volcanic districts has given rise in Japan to the manufacture of matches which are exported to all parts of the East. Below is given (for reference purposes only) a list of the chief minerals found in each country. Rewrite the list showing in what countries each mineral can be found.

Siberia.—Gold, silver, iron, lead, copper, coal, fossil, ivory.

Caucasia.—Gold, copper, coal, salt, petroleum.

Asia Minor.—Copper, silver, lead, iron, coal.

Persia.—Iron, lead, copper, coal, turquoise.

India.—Coal, oil, iron, tin, rock-salt, gold, diamonds, rubies.

Ceylon.—Rubies, sapphires, moonstones, graphite.

Malay Peninsula.—Tin.

French Indo-China.—Copper, iron, coal.

Malay Archipelago.—Gold, silver, diamonds, coal, iron, lead, copper, quicksilver.

China.—Coal, iron, copper, potter's-clay.

Japan.—Coal, iron, gold, silver, copper, lead, antimony, sulphur.

Corea.—Gold, copper, iron, coal.

REVISION EXERCISES

1. State and account for the chief characteristics of a land climate as regards variation of temperature, amount of rainfall, and distribution of wet and dry seasons. Give examples. O. J., 1907.
2. Draw a sketch-map of south-eastern England to show the North

and South Downs and the Weald. Insert as many rivers as you can, and mark carefully where they flow through the "Gaps" in the Downs.

O. J., 1907.

3. Draw a sketch-map of India showing its chief physical features.

O. J., 1888.

4. State the most important regions where coal is found in Asia. State the uses to which the coal is put and the position of the chief centre where it is consumed or exported.

L. J. S., 1906.

5. Describe the position and surface shape of the Deccan. Explain why the centre of the Deccan receives little rain from the south-west monsoon.

O. P., 1906.

6. Compare the courses of the Hwang-ho and the Yang-tse-Kiang, paying attention to the different characters and products of the countries through which each flows, and to the extent to which each is an advantage or disadvantage to these countries.

Civil Service, Supplementary Clerks' Examination, September, 1907.

CHAPTER XIX

DISTRIBUTION OF POPULATION. OCCUPATIONS

THE population of the world has been estimated as about 1,500 millions, and of this number about 841 millions live in Asia. Examine the map showing the distribution of population in Asia (Fig. 53). What countries have a population of under 1 per square mile? Are these countries hot or cold, barren or fertile? Answer the same questions for countries having a population of 1 to 8 per square mile, 8 to 32 per square mile, 32 to 64 per square mile, over 64 per square mile.

Consider the Tundra district. What is the population per square mile? As there is little to live upon, there are few people. The inhabitants of the Tundra get their living by hunting and fishing (sturgeon and salmon) in the summer, and by hunting fur-bearing animals in the winter. They are dependent on the reindeer for their existence. As the supply of vegetation is in all parts a very scanty one, the people must be continually wandering from place to place in search of food for their animals. They are, therefore, nomadic in their habits. In the winter they live on the forest edge of the Tundra, but in the summer, when the Tundra vegetation bursts forth and the rivers are thawed, there is a general movement to the north. Wherever men

live by hunting, whether it be in the Tundra or in a tropical forest, the population is always scattered, for if the population were dense, the animals upon which the people depend for their living would be killed in large numbers, supplies of food would fail, and then the hunting tribes would cease to exist.

Consider the central tableland stretching from Asia Minor to Manchuria. The density of the population varies very

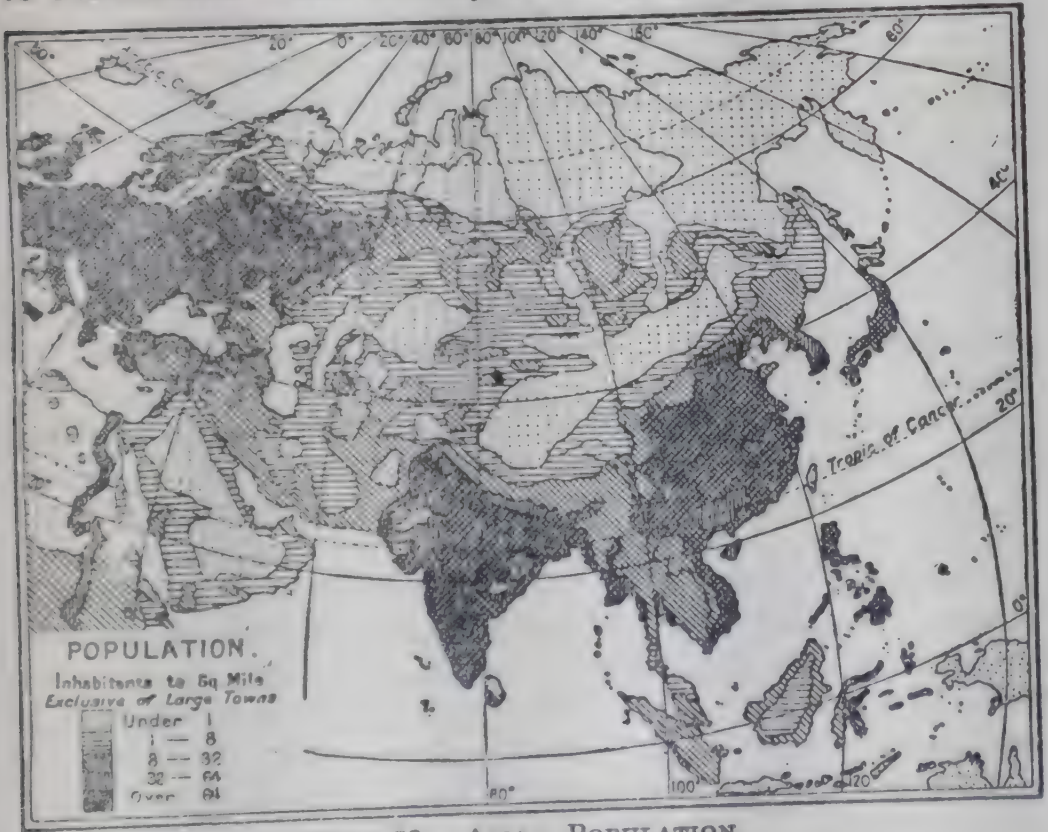


FIG. 53.—ASIA: POPULATION.

considerably in different parts of this area. What is it in the desert areas? What is it in the steppes? There are practically no dwellers in the deserts, for neither man nor beast can live on sand or salt. Where, however, water is obtainable, the ground can be cultivated and small settlements are found. On the steppes the population is scattered, for the people are nomads, who wander about with their flocks and herds in search of food. The only occupation of these people is the **breeding of the animals** which supply almost everything they need. The steppe dwellers

despise a settled life, and look with contempt on all those who dwell in towns.

Consider the monsoon lands. They are the most densely populated lands in the world. There are, however, one or two areas which are less thickly peopled than the rest. What countries are included in these areas? Where do they lie with respect to the other countries of the monsoon area?

The people in the monsoon lands are farmers, and live chiefly by **agriculture**. The best farming is found in China and Japan. Compare the map showing the density of the population with that showing the vegetation. Are the monsoon lands remarkable for their fertility or not? Is the thinly peopled area of the monsoon region a fertile one?

As the population increased in China and Japan, it expanded along the fertile river valleys where food could be obtained. In so doing, it moved along the same latitudes, so that the districts into which the surplus population flowed, had similar climates, plants, and animals to those in the land from which the migration had occurred. The habits of the people remained unchanged, and communication between various sections of the same people was easy. In which way do the rivers of Indo-China run? Now the inhabitants of these countries came from the north and followed the rivers. They came from lands that were cold, dry, and treeless, and moved into the midst of fertile plains and dense jungle, and into a very hot climate. They became changed in their habits, and lost much of their original energy and skill. And as the mountain ranges run north and south, communication was difficult or impossible, between the peoples living on opposite sides of the densely forested ranges.

Much of Asia is quite uninhabited, but in the fertile parts of the monsoon lands the people are closely packed together. In some of the fertile deltas there are as many as five hundred people to the square mile. India contains 300,000,000 inhabitants. It has more people than Africa, North America, and South America put together. Three out of every four of this enormous population are farmers and live largely

on vegetable food. To such a people the failure of the monsoon rain brings famine and death.

Manufactures are in a very backward condition, though China, India, and especially Japan, are making great strides in this direction. Japan manufactures pottery, metal work, lacquer ware, silk (Kioto), cotton (Osaka), watches and clocks (Tokio), umbrellas, glass, cement, pianos, beer.

China makes silk and porcelain,

In India, cotton is made at Cawnpore and Bombay; jute is woven at Calcutta; paper is made at Bengal and Bombay; shawls are made at Kashmir; metal work, especially in brass, is fashioned at Benares; and there is a flourishing leather industry at Cawnpore, where many leather goods such as saddlery, harness, etc., are made for the use of the Indian army.

Persia and Asia Minor make carpets of beautiful design and colour.

All the peoples of the monsoon lands are skilled in certain kinds of artwork. They are expert carvers of wood and ivory, skilful fashioners of gold and silver, and are famous for their lacquer work and enamelling.

REVISION EXERCISES

1. Describe some of the characteristic features of manufacturing industries in mountainous districts. Illustrate your answer by examples.

O. J., 1907.

2. Indicate the position and name the chief industry of each of the following towns, explaining why the industry has arisen where it is carried on: Barrow, Bradford, Chatham, Coventry, Llanberis, Nantwich, Northampton, Southampton, Swansea.

C. J., 1906.

3. Draw a map which will show the position of the Himalayas, Alleghany Mountains, Pamir Plateau, Indus, Lombok Strait, Bering Strait, Lake Michigan, Andaman Island, Formosa, Chesapeake Bay, Hong Kong, Vancouver.

4. What parts of Asia are inhabited by nomadic peoples? In what ways do these nomadic peoples make a living? In what kinds of lands are these nomadic peoples found?

O. S., 1906. L. J. S., 1907.

5. Where are grass lands found in Asia? How do you explain this? What is the chief occupation of the peoples in the great grass lands of Asia? Why?

L. J. S., 1906.

6. The monsoon region of Asia is estimated to contain seven-eighths of the inhabitants of the continent, although it includes only about one quarter of the area. What are the conditions which favour the large population? Mention any parts of the monsoon region not thickly populated and give reasons why they are not.

O. J., 1906.

CHAPTER XX

COMMERCE

ASIA exports chiefly raw materials to Europe and America, sending away such products as timber, furs, cotton, silk, wool, tea, coffee, spices and various kinds of grain. For centuries, spices, silk, etc., were exported to Europe over land, but until the arrival of the European, the sea-borne traffic of Asia was of a local, and comparatively unimportant character. The over-land trade was, and is still to a limited extent carried on by caravans, but these land routes will diminish in importance as the railways are extended. The great rivers will always form important means of communication between the various parts of the country through which they flow. We may divide the trade of Asia into eight distinct classes.

I. The "Levant" Trade is so called after the Levant, the name given to the eastern waters of the Mediterranean Sea. This trade covers Asia Minor south of the Black Sea limit, Syria, and some of the railway and caravan traffic of Turkistan, Caucasia and Central Asia.

Asia Minor exports tobacco, silk, opium, valonia, mohair, sponges, raisins, and dried figs. The chief port is **Smyrna**, the largest town in Asia Minor. The trade is carried on largely by Greeks and other Europeans. Other ports are **Sinope**, and **Trebizond**. Syria exports wheat, fruit, wool, tobacco, and hides. The chief ports are:—

Alexandretta, the port of Aleppo; **Beirut**, the port of Damascus; and **Jaffa** (Joppa) the port of Jerusalem, with which it is now connected by railway.

There are two important caravan centres (i) **Damascus**, the largest inland city and the capital of Syria. It commands those caravan routes across the Syrian desert that converge on Beirut, and has railway connexion with this port. (ii) **Aleppo** commands the shortest route between the plains of Mesopotamia and the shores of the Mediterranean. It has been repeatedly injured by earthquakes to which every part of Syria is more or less liable.

II. The Red Sea Trade is not of very great commercial value, but the sea itself is an important one, as forming part of the ocean highway from Europe to Asia. There are coaling stations at **Aden** and **Perim**. There are no rivers running into the Red Sea, and the greater part of the trade is confined to narrow strips of land along the coast. Arabia exports coffee and dates, and imports cotton goods. Inland, good roads do not exist, but there are a number of well-defined caravan tracks. One of these, along which a railway is now building, connects Damascus, Medina, and Mekka. **Mekka** is the birthplace and **Medina** is the burial place of Mohammed, the Arabian prophet. Pilgrims from many parts of the world come annually to visit Mekka, their Holy City. They land at the port of **Jidda**. Another caravan route from Medina and Mekka traverses the desert to **Kerbela** and **Baghdad**.

III. The Persian Gulf Trade covers all the merchandise sent up or down the Tigris, Euphrates, and Karun rivers. It is chiefly a caravan trade, and wherever a caravan can run, goods are collected and distributed. The exports from the Euphrates-Tigris basin include cereals, dates, and wool. The chief ports are :—(i) **Basra** (Bussorah) in the centre of a great date producing region. On what river does Basra stand? Before the discovery of the Cape route to India, much of the trade of the Far East passed through this town. (ii) **Bushire**. In what country? On what gulf? There are two important caravan centres. (i) **Diarbekr**. On what river? This town commands the trade between the upper part of Mesopotamia and the mountainous regions farther north. (ii) **Erzerum** is a strongly fortified city and the chief town in Turkish Armenia. Find on your map the route a caravan would travel in going from Erzerum to Diarbekr.

The chief Arabian port in the Persian Gulf is **Mascot**. It is the largest town in Arabia, the capital of Oman, and has a large trade with the surrounding countries. The chief exports are pearls and dates.

The trade of the plateau of Iran belongs partly to "the Persian Gulf Trade," partly to "the Indian trade," and partly to "the Caspian trade," goods being exported and

imported both to and from the east, west, and north. The plateau has no navigable rivers, and no railways, and so is entirely dependent on caravan trade. The caravan routes, wherever possible, follow the valleys. There are a few military roads of very great importance. The imports, which are more or less common to Persia, Afghanistan, and Baluchistan, are cotton goods, cloth, glass, sugar, petroleum, tea, coffee, and drugs. The exports are dried fruits, opium, cotton, wool, silk, carpets, pearls and turquoises. Persia sends her own products and those collected from Central Asia, to the Persian Gulf, to the Caspian Sea, to Asia Minor, and to India. Afghanistan and Baluchistan trade chiefly through and with India, especially as the Indian railways have now reached their frontiers at several different points. The following towns are important trade centres: **Herat**. In what country? Herat commands the route from the north-west into India. On what river is it? **Kabul** lies further east on the same caravan route as Herat. On what river is it? The river flows into India through the Khaibar Pass, a narrow defile about 30 miles long, and overhung by mountains which rise precipitously to a great height. The Khaibar Pass is the only one in the north-west of India which is practicable for artillery. Through it many successive invaders of India have marched. The pass is now securely fortified, and invasion by this route has been rendered a difficult and dangerous, if not an impossible enterprise. Kabul is the capital of Afghanistan, and owing to its position has a large transit trade.

Kandahar (Afghanistan) commands the valley of the Halmand, and stands in a fertile plain where fruit is largely grown. It has manufactures of silk and felt.

Tabriz (Persia) commands the trade in the north-west of Persia. The productions of northern India and Central Asia are here exchanged for British and continental manufactures, brought by caravan from the Black Sea, and from Russia through Caucasasia. Tabriz is in a fertile garden-like district.

Teheran is the capital of Persia, and an important caravan centre.

Shiraz, the old capital of Persia and still the centre of considerable trade, is situated in the most fertile part of Persia and enjoys a delightful climate.

Most of the trade of Baluchistan goes through the **Bolan Pass**, a narrow gorge about 51 miles long, which is traversed by a railway terminating beyond **Quetta**, the capital of British Baluchistan, at the frontier station of Chaman.

IV. The Indian Trade comprises the trade of the peninsula of Hindustan, and of the ports on the eastern side of the Bay of Bengal. It also includes the frontier trade with Afghanistan, Baluchistan, and Tibet, countries which have no ports of their own. The chief ports are as follows :—

Calcutta, the chief city and seat of government of Bengal, has large docks, and ranks as the first port in India. It is well drained, well lighted, and has a good water supply.

Bombay, the capital of Bombay Presidency, is situated on the island of Bombay, and possesses the best natural harbour in India. The port is rapidly rising in importance as the chief commercial centre of the Indian Empire, and almost rivals Calcutta with regard to the extent of its foreign trade.

Karachi, a short distance west of the mouth of the Indus, is the focus of the trade of the Indus and Punjab.

Madras, the capital of the Madras Presidency. On what coast is it? Madras has a considerable and ever increasing commerce.

Rangoon, exports rice and is the commercial and the political capital of Pegu. On what river is this port situated?

Moulmein.—Near the mouth of what river? It is the chief port and town of Tenasserim and has a great trade in teak. (For the inland trading towns, see Chapter XXI. *Railways*.)

The exports of India are :—Rice, hides, skins, oil-seeds, cotton, opium, jute, wheat, indigo, and wool. The imports are cotton goods, metal, railway material, sugar, mineral oils, machinery, silk, provisions, hardware, cutlery, clothes, woollen goods.

V. The Straits and East India Trade.—

This includes the trade of the Straits Settlements, Further India, and the East Indian Archipelago. The chief centre of the trade is Singapore, "the Gate of Eastern Asia." Singapore is upon a small island at the south of the Malay Peninsula, and is the seat of Government of the Straits Settlements. The harbour is strongly fortified, and there is a permanent British garrison. Singapore does an enormous trade with the surrounding countries, the United Kingdom, and America.

Further-India exports, teak, tin, spices, gambier, gums, tapioca, rattans, and copra.

Bangkok is the capital of Siam.

Saigon is the capital of French Indo China.

Manila is the chief city of the Philippine Islands and the seat of a great trade in hemp, sugar, coffee, tobacco, cigars.

VI. The China Trade.—China contains numerous cities, crowded with thousands of people who will some day become purchasers of large quantities of European goods. When the country has been completely opened up for trade, the markets of China will be of immense value to those who control them, and it is this fact that makes the manufacturing nations of Europe regard with jealousy the movements of each other in this part of the world. For many years to come, the rivers will form the natural commercial highways, and the development of trade will be comparatively slow, but when railways have been constructed so as to connect the great towns with each other and with the coast, the development of trade will be enormous. At present, Europeans are only permitted to trade at certain ports, known as "Treaty Ports." Of these there are now forty-three. The chief of these are as follows:—

Shanghai is at the entrance to the Yangtse-kiang valley and is the chief commercial emporium of China.

Hankow lies higher up the river and is the chief market of the inland tea districts.

I-chang, 1,000 miles from the sea, marks the limit of river navigation on the Yangtse-kiang for large steamers, and Chung King, 1,600 miles from the sea, the limit for smaller vessels.

Tientsin is the port for Peking.

Foochow is a great tea port.

Amoy, built on an island off the Fokien coast, is a manufacturing town and commercial port.

Canton was for many years the only emporium of the tea trade and is situated on the head of the estuary of the Canton River.

Hong Kong commands the entrance to one of the large rivers and is of great value as a storehouse. It is hilly, well watered, and fairly healthy. The district of **Kowloon**, on the mainland belongs, like Kong Kong, to the British.

Macao Island, west of Hong Kong, is an unimportant Portuguese Settlement.

Kiao-chow Bay, with its port **Tsingtao**, in Shantung, was leased to Germany; but is now occupied by Japan.

Kwantung, in the south of the Liaotung peninsula, formerly leased by Russia, now belongs to Japan. Port **Arthur** and **Dairen** (Dalay), the former strongly fortified, and the latter the commercial port, are termini of the Trans-Siberian Railway.

The chief exports of China are tea (mainly to the United States, the United Kingdom and Russia), raw silk and silk goods, straw-plait, camphor, and sugar. The imports include cotton goods, woollen goods, opium and kerosene oil.

VII. The Japanese Trade.—The imports are rice, cotton, sugar, iron, locomotives, machinery, woollen goods. The exports are raw silk, silk goods, cotton yarn, coal, copper, food, tea, textiles, matches, rice, and drugs.

The chief ports are :—

Yokohama.—For what town is this the port? On what gulf does this port stand? Yokohama is the centre of the trade with the west.

Osaka, on the Inland Sea, is, after Yokohama, the most important "treaty port."

Kobe.—On what gulf? For what town is Kobe the port? Kobe imports cotton and machinery.

Nagasaki has the best natural harbour in Japan. The port is near coal fields and supplies the steamers trading between China and America with fuel.

Hiroshima, in south-west Honshiu, is an important port
Hakodate.—At the southern end of what island does this port stand? The port has a fine land-locked harbour and trades in coal and fish.

The Japanese islands are favourably situated for commerce as they are within reach of China, Canada, the United States, India and the East Indian Archipelago.

VIII. The Trade of North and Central Asia.
 This includes the trade of Siberia, Tibet, Mongolia, Turkistan, and Manchuria. North and Central Asia are badly situated for external commerce as the rivers run into a sea that is frozen for the greater part of the year and there are few good roads. Trade can only increase to any extent with the development of the railways. There are no manufactures, and all finished goods are imported. Payment is made in raw materials. A caravan route called the **Trakt** crosses Siberia from west to east, and prior to the completion of the great Trans-Siberian railway was of the greatest importance. It carried to Europe the tea and the silk of China, and the furs and metals of Siberia. Mark it on a map. The route is indicated by the names of the towns given below.

Ekaterinburg.

Omsk.—At the junction of what rivers does Omsk stand? This town is one of the largest towns in Western Siberia and is an important commercial centre. It trades with the Kirghiz shepherds, exchanging tea and furs for hides.

Tomsk.—Near the junction of what two rivers is Tomsk situated? It lies in the neighbourhood of gold and coal.

Irkutsk is the capital of E. Siberia. On what river does it stand? Irkutsk is the largest town in Siberia, is an important railway and lake junction, and has a large trade in furs.

Kiakhta.—At this place, to the south of Lake Baikal, opposite the Chinese frontier town of Maimachin, the Russian and Chinese traders meet for the exchange of goods.

Vladivostok is the chief naval station of the Russians in the Pacific.

REVISION EXERCISES

1. Of what materials are volcanic cones composed and how are they arranged?

O. J., 1905.

2. Give the positions of the ports on the west coast of England and Wales from north to south and account for their growth or decline.
C. S., 1906.

3. Describe the land frontiers of India, naming the countries adjacent, illustrating by a sketch map if possible what sort of trade there is across the frontier.
O. J., 1901.

4. Describe the land routes into India, and the natural obstacles that would confront an invading army.
O. S. 1905.

5. (a) What are the most important products exported from India to the United Kingdom ? (b) Give a short account of the mineral wealth of India.
O. J., 1899.

CHAPTER XXI

RAILWAYS

THE development of railways in Asia has been slowly progressing during recent years. Without railways, traffic between the various parts of the interior of the continent and the coast is, and must be, slow and uncertain. The construction of railways has been delayed in some countries partly by the nature of the surface, and partly by the apathy or opposition of the natives. The main railway systems at the present time are three. Of these the Trans-Caspian Railway and the Trans-Siberian Railway have been built by the Russians, while the Indian railways have been constructed by the British. China has at last realized the necessity of building railways, but the work is being done entirely by Europeans. China has now about 4,000 miles of railway, but not one of these has she built herself.

Take a political map of Asia and on it mark in thick red lines the various railway routes as given below.

The Great Siberian Railway.—Moscow is the European terminus. An express train leaves for Siberia twice a week. The cars are larger and broader than those in use in this country, and trains are provided with dining saloons, library, bath-rooms, barber's shop, and a dark room for amateur photographers.

Across what plain does the line run after leaving Moscow ?
Samara is on the left bank of the Volga. At this point the

river is crossed by a fine railway bridge. What mountains must be crossed before the railway can enter Siberia? The mountains are low and the passage across them has presented no great engineering difficulties. What town stands at the point where the railway enters Siberia? It is rapidly growing, as indeed are most of the other towns on this line. During the last ten or twelve years over 600,000 settlers have entered Siberia by this route. Many of the settlers have been given large pieces of land, with all the implements and cattle necessary to establish them upon the land as farmers. Across what Asiatic plain does the line run? This plain is at first a dreary district with only occasional birch groves and salt marshes to break the monotony. What is the population per square mile on the plain? The smaller villages, seen from the train, are often nothing more than mere collections of log-cabins. The train crosses the Tobol by a heavy iron bridge. Of what river is the Tobol a tributary? What town stands at the junction of the two rivers? This town has a great trade in corn, salt, and fish.

Omsk is the capital of the steppes. On the steppes thousands of cattle are reared, and Omsk has a flourishing trade in butter. On what river does Omsk stand? What is the next large river to be crossed after leaving Omsk? Between the two rivers the land still forms part of the steppe region. What town lies on the river north of the point where it is crossed by the railway? This is the most important town in Western Siberia, and has supplies of gold, coal, and iron.

East of the River Ob wooded hills appear, and in the summer-time the green grass of the steppes is relieved by the bright tints of many coloured flowers. The villages are still chiefly composed of log-cabins, the spaces between the logs being filled with moss to keep out the winter cold. Horses, cattle, sheep and goats are to be seen everywhere. After crossing the Yenisei the railway runs south-east, and as the mountains are neared the scenery increases in interest.

Irkutsk.—On what river does this town stand? Near to what lake? The houses are of wood, but the public buildings are of stone. Irkutsk has been called the "Paris of

Siberia," but is not a very comfortable place in which to live, for in summer it is as hot as India, while in winter it is so cold that the mercury in the thermometer freezes. Irkutsk is a great caravan centre. One caravan route runs west to the Urals; a second goes east to Kiakhta, and on to Peking; a third runs to Yakutsk on the Lena, and thence to Okhotsk; a fourth follows the Amur to the sea. As the railway is extended and branch lines are made, the caravan routes will almost entirely disappear. Irkutsk has a brisk trade in tea and furs. Whence are these products obtained?

When the railway was first made, a break was left in the line on reaching Lake Baikal, and the journey across the lake was made by boat. In winter the ice on the lake was often three feet thick, and ice-breaking steamers were employed. As the boats were unable to reach the shore, sleighs were employed to carry the passengers from the steamers to the railway station. But in 1904 the continuation of the line from Irkutsk round the southern end of the lake was finished. As the southern shore is bounded by steep granite cliffs, rising sheer from the water's edge, the construction of this section of the line presented considerable difficulties.

Chita stands at the head of the navigation of the Amur. What mountains lie near Chita? The railway passes through an important silver-mining district. After crossing latitude 50° N., what province is entered?

Kharbin, or Harbin.—What mountains lie to the west? They are pierced by a tunnel more than a mile long. On what river does Kharbin stand?

Vladivostok.—From London to Vladivostok via Havre is a little over 7,000 miles.

From Kharbin a branch line runs through Kirin and Moukden to Port Arthur. Port Arthur was taken from the Russians by the Japanese in 1905. By the treaty that ended the Russo-Japanese war, Japan was given control of the railway between Mukden and Port Arthur. The Russian and Japanese Governments have now reached an understanding, whereby the railway connexions through Siberia and Manchuria will be considerably improved.

A great Japanese steamship company is to start a steamer

service between Port Arthur and Shanghai. It is reckoned that in this way the journey from Paris to Shanghai may be accomplished *in 17 days*.

The Trans-Caspian Railway.—Krasnovodsk (lat. 40° N.), on the Caspian Sea, is one of the termini of the Trans-Caspian Railway. What oil-exporting town is almost opposite Krasnovodsk on the other side of the Caspian? The railway runs south-east. What desert lies north of the line? On the south there are lofty mountains. Of what country do they in part form the boundary?

Merv.—A branch line runs to the frontier of Afghanistan and stops about 70 miles from Herat. This branch line is of strategic value only. After leaving Merv, a dreary desert of sand, almost devoid of vegetation, is crossed. What river is reached? In the neighbourhood of the river the value of water is at once apparent. The sands of the desert give place to gardens, groves, and orchards, where fruit is so abundant that grapes are sold at a half-penny a pound. After crossing the river what province is entered?

Bokhara is a natural trade centre for Persia, China, India, and Russia. What river loses itself in the sands not far from this town? The waters of this river make it possible to grow cotton at Bokhara.

Samarkand.—On what river? The town commands the fertile valley of the river.

Tashkent, the political and commercial capital of Asiatic Russia, exports silk, hides, and skins, and manufactures leather. Notice the branch line running to **Khokand**, an important trade centre.

From Tashkent a line runs along the valley of the Syr Daria to Orenburg, and thence to Moscow and St. Petersburg.

The Trans-Caspian Railway has been of great value to Russia in the development of her trade with regions that were previously almost closed to European commerce. It has stimulated the growth and export of cotton, and with the increase of population, it will become of ever-increasing value and importance. The line from Tashkent to Orenburg is chiefly of strategic importance.

The Trans-Caucasian Railway.—Rostof, on the River Don (Russia). The railway line runs from Rostof

south-east to **Vladikavkaz**, and thence to **Petrovsk** on the Caspian. It follows the shore through **Derbent** to **Baku**. At **Baku** it turns west. The district between the Caucasus Mountains and Armenia is called **Trans-Caucasia**. At Mount **Ararat**, on the southern border, the Russian, Turkish, and Persian empires meet. The soil of **Trans-Caucasia** is, on the whole, exceedingly fertile, and, despite the primitive methods of cultivation adopted by the farmers, produces large quantities of tobacco, cotton, rice, grapes, figs, almonds, and peaches. There are thick forests of beech and walnut, and in the mountains supplies of coal, copper, lead, and silver are found. At **Baku** there are numerous petroleum wells. To the development of such a district a railway is of the very greatest importance.

Through what valley does the line climb to the plateau after leaving **Baku**?

Tiflis.—On what river does it stand? **Tiflis**, the capital of **Caucasia**, is strongly fortified, and stands at the southern end of the great military road which runs from **Russia** and crosses the mountains by means of the **Dariel Pass**. It is in the province of **Georgia**. The **Georgians** are said to be the most handsome race of men and women in the world. **Tiflis** is connected by rail with **Erivan** and **Kars**. **Kars** is strongly fortified. **Erivan**, the capital of **Russian Armenia**, collects cotton for export to **Europe**. From **Tiflis** the railway runs to the coast.

Poti, a port on the **Black Sea**.

Batum, on the **Black Sea**. What is exported from **Batum**?

Indian Railways.

Indian railways have been constructed to facilitate the movements of troops, to develop trade, and to enable grain to be rapidly carried to the starving peasants during times of famine. The chief lines run east and west across the Northern Plain, and across the tableland of the Deccan. Mark them on a political map of India, and notice what use has been made of the river valleys.

East Indian Railway.—**Calcutta**, the capital of India, stands on the **Hoghly**, collects the produce of the **Ganges**

valley for export, and imports the goods required by the natives. Coal supplies for the railway are obtained from the mines of Chota Nagpur.

Patna.—On the left bank of what river?

Benares is the oldest and the most sacred city in India. To see it is to become sinless. To die within its walls is to go to Paradise.

Allahabad.—On what river? This is the chief railway centre in India, the capital of the United Provinces of Agra and Oudh, and the seat of the Lieutenant-Governor. Between Benares and Allahabad the country is flat. In the dry season opium and wheat are grown. In the wet season the chief crop is rice. Through the whole of the United Provinces the soil is fertile, and the rainfall abundant.

Cawnpore trades in leather, wheat, and cotton, and is one of the chief manufacturing towns in India.

Lucknow, fifty miles from Cawnpore, is connected with the latter town and with other parts of India by rail. On what river does it stand? Lucknow, formerly the capital of Oudh, stands on a fertile plain and on a navigable river, and is a military as well as a railway centre. Like many of the other towns in this part of India, it played an important part in the Indian Mutiny.

Agra.—On what river? Agra commands the trade between Delhi and the Deccan. It is the seat of the Taj-Mahal, one of the most beautiful buildings in the world. The Taj-Mahal is a tomb which was built by the Emperor Sha Jehan for his wife. It cost £3,000,000 and took 20,000 workmen twenty-two years to build.

Delhi, on the Jumna, is one of the oldest cities in India, and since 1912 the capital of the Indian Empire. Its position gives it an important trade with the basins of both the Indus and the Ganges. It has railway communication with all parts of India.

Amritsar.—After crossing a broad, fertile plain, the railway arrives at Amritsar, the head-quarters of the Sikh religion. Amritsar collects and exports wheat, commands the Kashmir wool trade, and manufactures Kashmir shawls out of goat's hair.

Lahore.—On what river? Lahore, the chief city of

the Punjab, is an important railway junction. Note the direction taken by the lines radiating from Lahore.

Attock.—On what river? What rivers are crossed by the railway between Lahore and Attock? What is the province containing these rivers called?

Peshawar, the capital of the New North-West Frontier Province, is strongly fortified. What pass does it command?

The Great Indian Peninsular Railway.—**Bombay** is within reach of the cotton of the Deccan, and the coal of the Nerbada valley, and hence is the chief cotton manufacturing town in India. It also manufactures iron, silk, and flour, and has tanning, dyeing and metal-working industries. It is the chief port on the Arabian Sea.

Surat.—At Surat the railway commences the ascent of the Western Ghats.

The plateau of the Deccan, bounded by the Eastern and Western Ghats on the east and west respectively, was, before the coming of the railways, but little commercially developed. The rivers on the west were too short and too rapid, and the rivers on the east had to make their descent from the plateau to the coast through a narrow coastal plain, and were therefore useless for navigation. But railways have now been made in many directions across the Deccan, and hence the difficulty of transmitting goods has been largely overcome. The Western Ghats are so steep that in many places the making of curves is impracticable, and the railway line has to zigzag continually in order to ascend. Here and there, there are **reversing stations** where the train is shunted from one zigzag to another. This process is continually repeated, until at last the train arrives on the wide plains and rocky flats of the Deccan. A comparatively short descent leads to the valley of the Nerbada. What hills bound this valley (*a*) on the north, (*b*) on the south?

Jubbulpore is an important commercial town, the traffic which passes through it being larger than that of any other town in India except Bombay.

Allahabad.

Insert on your map the following railway routes:—

I. PESHAWAR TO KARACHI.—What river valley does it follow? Insert the branch to **Quetta**, the capital of British Baluchistan, and **Chaman**, a fortified frontier town commanding the caravan route to Kandahar.

II. CALCUTTA.

Nagpur.—The line runs through vast forests and dense jungle. Nagpur is the capital of the Central Province, an area which includes the wheat-growing valley of the Narbada, a portion of the Mahanadi, and the cotton and coal districts of the Godavari basin.

Surat.

Bombay.

III. BOMBAY.

Poona, the head-quarters of the Lieutenant-Governor of Bombay during the rainy season, stands at a height of 1,820 feet, at the eastern and dry end of the pass across the Western Ghats.

Hyderabad, the capital of Hyderabad, the largest of the native states of India, is the residence of the Nizam, the ruler of the province. It stands on a small plain, has an abundant water supply, is surrounded by a ring of defensive hills, and is within easy reach of the diamond mines of Golconda. Insert the connexion between this line and the line on the east coast.

IV. GOA belongs to the Portuguese. On what coast is it?

Madras has not many manufactures, and possesses only an artificial harbour, but it has considerable commerce, and is also an educational centre, and the seat of a university.

V.—A line runs down the east coast from **Calcutta** as far as **Cocanada**. It then turns inland and meets the line from Goa to Madras. What rivers does it cross? From Madras we go south to the French possession of **Pondicherri**.

Trichinopoli.—On what river? Trichinopoli is the second largest town in Madras, and manufactures cheroots and jewellery.

VI. MADRAS.

Bangalore stands on one of the highest parts of the Deccan and has a fine climate. Here corn and cotton are

grown. In what native state is Bangalore? Note the connexions by rail with Bombay, Madras, and Mysore. Insert these connexions on your map.

Railways in Indo-China

Rangoon.

Mandalay.—Through what river valley does this line run? At Mandalay the railway sends off two branches to the frontier of Yunnan. Insert them. It is probable that in the future the Burma railway system will be connected with the Indian railway system via the valley of the Brahmaputra.

There are several unimportant railways in Siam.

Chinese Railways

Railway enterprise in China is but of recent growth, but already nearly 4,000 miles are in operation, and new lines are in process of construction. The line from the Manchurian frontier to Darien or Dalny is 1,180 miles long.

I. PEKING.

Tientsin.—Down what valley does the railway run? The line then follows the coast to **Newchwang**, where a short branch line connects it with the Manchurian line. This railway was built by the British.

II. PEKING.

Hankow.—What rivers does the line cross or connect? This is the most important line in China, as it connects North China with Middle China, and with the rich valley of the Yang-tse-kiang. It was built by the Belgians.

REVISION EXERCISES

1. Explain briefly what is meant by the following: the meridian of Greenwich, the Tropic of Cancer, the Arctic Circle.
Explain why the scale of units attached to a map of a large continent cannot be used for measuring long distances in all directions upon that map.

C. J., 1892.

2. Give the positions of the chief coal-fields in Great Britain, with the principal towns on them.

C. S., 1906.

3. On a map of Asia mark the Tian Shan and Sulaiman Mountains: the rivers Irrawaddy, Euphrates, and Hwang-ho; the provinces Manchuria

and Bengal; the towns Peking, Irkutsk, Rangoon, Karachi, and Yokohama. Trace the course of the Great Siberian Railway.

O. S., 1906.

4. In the peninsular portion of India the nature of the surface has placed several difficulties in the way of communication between the coast and the interior. What are these special difficulties? How far have they been overcome by the construction of railways?

O. J., 1906.

5. Describe the route of the Trans-Siberian Railway.

C. S., 1906.

CHAPTER XXII

POLITICAL DIVISIONS

FOR many years Asia has been gradually passing into the possession of various European nations. The British have conquered India, parts of the Malay Peninsula, Ceylon, and Burma. The Russians have taken the whole of northern Asia, from the Urals to the Pacific. A large portion of Indo-China belongs to the French. The Dutch are the owners of the greater part of the Malay Peninsula. Asia Minor, and parts of Arabia, are under Turkish government. More than half the population of Asia is governed by European powers. The largest of the independent countries is China. Small portions of Chinese territory have been ceded or leased to Great Britain, France, and Germany. More territory would probably have been demanded in the future by various European nations, had it not been for the war between Japan and Russia. In this war Japan proved herself a very powerful foe, and as she would probably resist any serious attempt to break up the Chinese Empire, the European powers are not likely for the present to obtain much more land in China.

For many years England has feared that Russia might make an attack on India, and the gradually growing influence of Russia in Persia has been jealously watched. In September, 1907, however, an Anglo-Russian Convention was signed by both Russia and England, which for the time being has defined their separate spheres of influence in Western Asia.

Take a large blank map of Asia, showing the boundaries of the countries, and colour with a distinct colour the posses-

sions of each of the European powers : British red, Russian yellow, and so on. In the case of India, colour the whole area red on the map of Asia, and then take a separate map of this country and colour red only those parts belonging to the British. Indicate the various native states with other colours in such a way as to shew which are tributary, and which are independent.

Asiatic Russia

Siberia is larger than Europe, but its average population is under one per square mile. A considerable part of the population consists of Russian exiles, who inhabit the best parts of the country, particularly the river valleys.

Caucasia contains nearly twice as many people as Siberia. The country is beautiful, the climate is good, the soil is fertile, and there is an abundance of mineral wealth. Caucasia includes the old country of Georgia and part of the old country of Armenia.

Russian Central Asia, or Western Turkistan.—The country, though dry is wonderfully fertile in the river valleys. Tashkent is the chief town.

The military collapse of Russia, and the subsequent Revolutions, have thrown the whole of Asiatic Russia into a state of complete chaos. Numerous independent Republics have been proclaimed, and Allied troops control the Siberian Railway.

British Possessions

These include the Empire of India, Ceylon, the Straits Settlements, the Malay States, British North Borneo, a number of small islands, such as Perim, and certain settlements on the coast, such as Aden and Hong Kong. Examine a political map of Asia, and make a list of all the smaller possessions, arranging them in three columns thus :—

Possession.	Island, or on Mainland.	In what country ?

“The Indian Empire has well been called ‘the brightest

jewel in the British crown,' and is worthy of the genius that has been applied and the sacrifices that have been made in times past, in order to render this vast assemblage of nations a worthy, civilized, and well-organized portion of the British Empire. It is an epitome of a continent; with regions lying under perpetual snow, with vast mountain ranges crossed by mighty and awe-inspiring passes, with fertile river valleys and barren desert regions, with plateaus and tropical regions, with rainless regions and districts receiving the deluge of the Indian monsoons, with a variety of races differing in appearance, in language, in religion, and in character, the British Empire in India is at once the most interesting and the most important country in Asia. Its enormous resources have made it, even before the discovery of the sea-route to India, the goal of European enterprise, and the remaining possessions of France and Portugal on its coasts evidence the efforts made by those countries to secure what has become the most unique portion of the great empire under the rule of the Kaiser-i-Hind" (*Clarke's Modern Geography*). India is politically divided into (1) British Possessions, (2) Native States, (3) Foreign Possessions. The Empire is governed by a Viceroy, who represents the Crown, and who is responsible to the Secretary of State for India. He is assisted by an Executive Council of six members, one of whom is the Commander-in-Chief of the Indian army. Other members are added to form a Legislative Council for the making of laws and regulations for the Indian Empire as a whole, and for those provinces which have no Local Councils.

The chief divisions are :

- i. Bengal, the most densely peopled and the most productive of all the provinces.
- ii. The United Provinces of Agra and Oudh.
- iii. The Punjab.
- iv. The North-West Frontier Province.
- v. The Central Provinces.
- vi. Eastern Bengal and Assam.
- vii. Bombay.
- viii. Madras.
- ix. Burma.

Copy the above list in your notebook and write the chief towns in each of these provinces in a separate column.

Province.	Chief Towns.

There are 680 Native States, of which only about 200 are of any size, and only a few are of any political importance. They are classed as (i) Dependent Native States, or those which are dependent upon various British Presidencies and Provinces; (ii) Tributary States which have their own princes or rajahs, and (iii) Independent States.

The rulers of the Native States "have no right to make war or peace, or to send ambassadors to each other or to external states; they are not permitted to maintain a military force above a certain specified limit; no European is allowed to reside at any of their courts without special sanction; the supreme government can exercise the right of dethronement in case of misgovernment. Within these limits, the more important chiefs possess sovereign authority in their own territories. Some of them are required to pay an annual tribute; with others this is nominal, or is not demanded" (*The Statesman's Year Book*).

The Dependent Native States are eighty-two in number. The chief are Travancore, Cochin, Gujarat, and Cutch.

Besides these, Kashmir, Baluchistan, and Sikhim are also dependent on, or feudatory to, British India.

Baluchistan.—The Baluchis are nominally subject to the Khan of Kalat, but he is controlled by the Agent of the Governor-General of India, and the whole of the country is now under British protection.

The Tributary Native States include Rajputana, Central India, Hyderabad, Mysore, Baroda, and Manipur.

The two Independent States are Nepal and Bhutan. Nepal supplies most of the recruits for the famous Gurkha regiments of the Indian army.

Ceylon is a Crown Colony, under a Governor and Executive Council. The capital and largest town is Colombo. The old capital is Kandy.

The Straits Settlements form a Crown Colony, and the Governor controls the British residents in the Native Protected States of the Malay Peninsula. The Straits Settlements comprise Penang, Wellesley Province, and the Dindings, Malacca, and Singapore.

British North Borneo.—This is the richest part of the island of Borneo, and possesses the only good harbours. The climate is healthy, the soil is fertile, and timber, sago, rice, gums, spices and tobacco are grown in abundance. The capital is Sandakan.

Labuan exports coal, sago, gutta-percha, india-rubber, and wax. The colony is under the government of North Borneo. The capital, Victoria, possesses a splendid harbour.

Sarawak is ruled by an Englishman, who bears the title of rajah. The State, which is under British protection, exports timber and coal.

Hong Kong, a British Crown Colony, includes Hong Kong Island, lying at the mouth of the Canton River, and the adjoining peninsula of Kowloon. The capital, Victoria, on a magnificent harbour, has an enormous trade.

French Possessions

France still retains a few small settlements in India, viz. Pondicherry, Chandernagore, Mahé, Karikal, and Yanam.

French Indo-China consists of three areas; Tongking, Annam, and Cambodia-Cochin-China. The Governor-General of French Indo-China resides at Saigon.

German Possessions

Germany formerly had a naval station, Kiao-chow Bay on the Shantung Peninsula. It possesses a good harbour, a healthy climate, and a valuable strategical position. The commercial port is Tsingtao also under German control.

Kiao-chow was captured early in the Great War by the British and Japanese, and is now in the occupation of Japan. The portion of New Guinea under German control was also captured by an Australian Expedition, and is under the Commonwealth administrations.

Turkish Possessions

Before the Great War Asiatic Turkey included Asia Minor, part of Armenia, the Euphrates-Tigris basin, Syria, and a portion of Arabia. Turkish rule will probably be confined ultimately to Asia Minor, where the Turks form a majority of the population. (

Possession.	Chief Towns.

Possessions of the United States of America

The Philippine Islands belonged to Spain until the war between that country and the United States of America. The largest island is Luzon, on which is situated the capital, Manila. All the Philippine islands are mountainous, well watered, fertile, and productive.

Portuguese Possessions

These are small and of little importance.

Part of Timor	.. .. .	In the East Indies.
Goa, Damão and Diu Island	.. .. .	„ India.
Macão	.. .. .	„ China.

Dutch Possessions

These include (i) the Larger Sunda Islands (Sumatra, Java, Borneo and Celebes), (ii) the Smaller Sunda Islands, (iii) the Moluccas, or Spice Islands, and (iv) Western New Guinea.

Java is one of the most fertile, the most productive, and the most densely peopled of all tropical islands.

Rice, coffee, sugar, tobacco, pepper, indigo and tea are the chief exports.

The capital is Batavia.

A part of the telegraph connexion between the United Kingdom and Australia crosses this island.

Sumatra.—Capital, Padang.

Borneo.—About three-fifths of this island belong to the Dutch, but their authority does not extend far from the coast.

Celebes.—Capital, Macassar.

Independent Countries

Arabia.—The people are divided into tribes governed by sheikhs, who occupy in each tribe the place of a father in a family. Most of these tribes are quite independent and owe no allegiance to any central government. Aden belongs to the British, and the Sultanate of Oman is under British protection. The principal Arab ruler is the King of the Hedjaz.

Persia is an independent country, whose ruler is called the Shâh-in-Shâh, or "King of Kings." He was formerly an absolute monarch, but in 1906 he granted to his people a Constitution, with a National Assembly, elected by the nobles, merchants, and landowners; and a Ministry formed on European lines. By a recent agreement between Russia and the United Kingdom, Northern Persia is included in a Russian "Commercial Sphere," and a part of South-East Persia has been assigned to a corresponding British Commercial Sphere. Education is generally poor and badly organized.

Afghanistan.—There are a large number of semi-independent tribes in Afghanistan. But most of them are willing to recognize the Amir of Kabul as their sovereign, provided he does not attempt too great an interference with their customs and their property. The Amir receives a heavy subsidy from the British Government, and is not allowed to enter into any foreign relations without their permission.

China covers more than a quarter of Asia and is of itself greater than all Europe. The chief divisions of China are:

China Proper	...	...	Capital, Peking
Tibet	...	...	„ Lhasa.
Manchuria	..	...	„ Moukden.

Mongolia, in the north of China has recently declared its independence. The capital is Urga.

The Emperor of China, the "Son of Heaven," is an absolute monarch. Under him are officials of graduated rank, called mandarins, who administer the different provinces and districts.

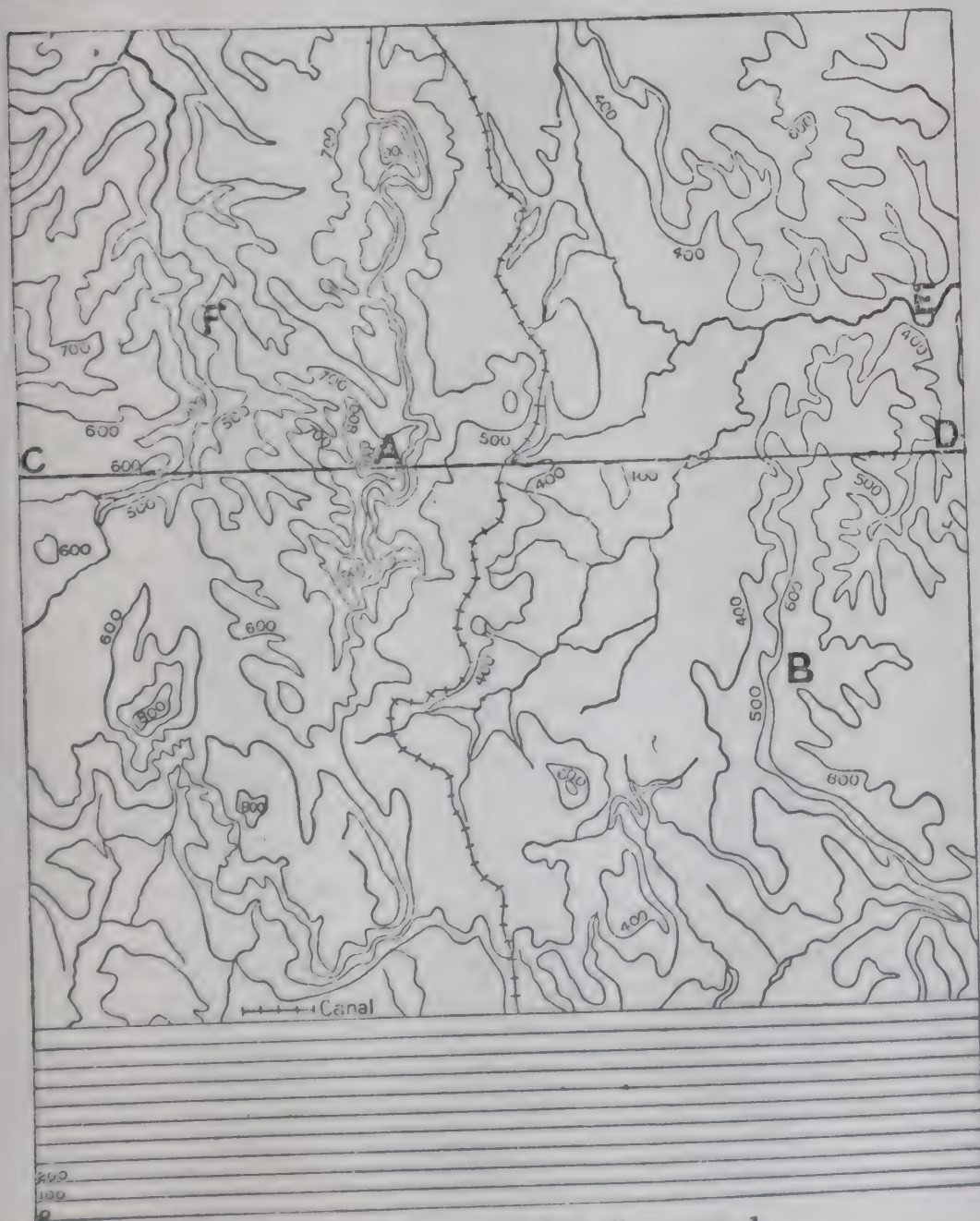


FIG. 54.—CHAPTER XXII, EXERCISE 1.

Corea is "the Land of the Morning Calm." In what ways does this peninsula resemble Italy? The most impor-

tant product is gin-seng, a root yielding an intoxicating drug.

The capital of Corea is Seoul. The country was formerly an absolute monarchy, but as a result of the Russo-Japanese war it came under the control of Japan, by whom it has been recently annexed.

Japan is ruled by the Mikado, and by a Parliament which met for the first time in 1890, at Tokio. The Emperor can declare war, make peace, and conclude treaties, but no laws can be made without the consent of the House of Peers and the House of Representatives.

Siam is ruled by a king, who is practically absolute, though he has a Council to advise him, and to draw up laws for his sanction and approval. The capital is Bangkok. The only other large town is Chieng-Mai, in the north.

REVISION EXERCISES

1. Write a brief description of the country seen from the point A on Fig. 54 looking (a) north-west, (b) south-west. Show the route you would follow in carrying a railway from E to F. Draw a section along CD in the space provided below the map. L. J. S., 1907.

2. Name and state precisely the position of five of the chief ports on the coast of England. Point out, as far as you can, how geographical conditions have affected their position and trade. L. J. S., 1907.

3. "The French and the English in Indo-China." Explain by a sketch-map what parts of Indo-China are under the control of the French or British governments. Name the country and mark important places. O. S., 1888.

4. Describe the general physical features of Asiatic Russia, naming the principal productions and the localities in which they are produced. C. J., 1906.

5. Give a brief geographical description (naming the chief productions, and indicating the position of the principal towns) of the Empire of Japan. C. J., 1906; L. J. S., 1907.

6. Write a short account of the climate and products of the Deccan. What are the chief reasons for the Deccan being more thinly populated than the northern parts of India? O. S., 1907.

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CHAPTER XXIII

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RACES AND RELIGIONS 5.7.81

Date:

THE people of Asia belong to four distinct groups.

- i. The Aryan
- ii. The Semite.
- iii. The Malay.
- iv. The Mongolian.

Take a blank map of Asia, and using four distinct colours, indicate the countries where the above families are found.

i. **The Aryans.**—These include the peasants of Persia, the Afghans, Baluchis, and Kurds of the Iranian highlands. "At an epoch, which cannot be accurately determined, but which is supposed to have been about 1600 B.C., a colony of the Aryans or Indo-European race, fair complexioned people from the plateau of the north, descended into the great plain of Northern India, and establishing themselves there by physical force and higher culture, spread out and diffused themselves as the dominant race over all the low country northward of the Vindhya Mountains. Thus was formed the nation we know as the Hindus (the dwellers by the Indus river), who are the most highly cultivated of the Asiatic Aryans" (Keith Johnston).

The people whom these invading Aryans drove from the northern plains of India into the southern tableland of the Deccan belong to a dark brown type, the Dravidians. The Dravidians are shorter and darker than the Hindus and speak a different language, but they call themselves Hindus and many profess the Hindu religion.

On your map colour the Deccan a different colour to that used for the rest of India, and remember that here there are found, not merely the Aryan families, but also these Dravidian tribes whose relationship to the other great families of mankind is not known.

ii. **The Semitic** races live in Syria, Arabia, Armenia, and the Euphrates-Tigris valley. Those upon the borders

of these regions are under Turkish government, while those in the interior of Arabia and the Bedouins of the Syrian desert are independent.

iii. **The Malays** occupy the Malay Peninsula. They have brown skins, black hair, large mouths, short, flat noses, and slight but well-formed limbs. They are mostly of comparatively short stature. There are many different tribes, differing from one another in character and occupation. Some are farmers; some are fishermen; others are pirates. Some are peaceful; some are bloodthirsty and revengeful; others, in Sumatra, Celebes, and Borneo, are cannibals.

iv. **The Mongols** occupy China and Tibet, Japan, Burma, and the other parts of the Continent not yet mentioned, with the exception of Cambodia. They have yellowish-brown or olive complexions; broad, flat faces; obliquely set, deep, sunken eyes; lank black hair; little beard; and broad, square, thick-set frames. They are generally shorter than Europeans. The **Khmers** of Cambodia are not Mongols, and their position is as yet undetermined.

To Asia Europe is indebted for her domesticated animals, her cultivated plants, some of her learning, and for her religion. Asia is the home of three of the most important religions, viz. the Christian, the Jewish, and the Mohammedan. The Jews are now scattered over the whole world, and the Christians are to be found chiefly in Europe, America, and Australia; but Mohammedanism still prevails over large parts of the continent of Asia. Take a blank map of Asia and colour it to show the distribution of the following religions.

i. **Mohammedanism** prevails all over the south-west of Asia, Asiatic Turkey, Arabia, Persia, and Turkistan. About a quarter of the people of India are Mohammedans, and this religion has also penetrated among some of the Malay tribes of the East Indies. The chief article of belief to a Mohammedan is, "There is no God but God, and Mohammed is His prophet." Mohammed taught that the Creator rules the universe with love and mercy, and is alone to be worshipped; that in times of adversity there must be

no murmuring against His decrees; that He must always be looked upon with trustfulness and love. A modern Mohammedan is a fatalist. He also believes in eternal punishment for all who worship idols, or do not believe in the prophet. He makes frequent ablutions, prays five times a day, goes on a pilgrimage to Mekka if he can find the time and the money, fasts often, does not touch wine or pork, and gives alms as a duty. His sacred book is the Koran, and his day of rest is our Friday.

ii. **Brahminism** prevails chiefly in India. There are, according to this religion, three chief gods: Brahma, the Creator of the universe; Siva, the destroyer; and Vishnu, the preserver. The sacred books are the Vedas, probably the oldest literary documents in existence. Only the pure can attain eternal bliss. The wicked are reborn, sometimes as men, sometimes as animals, and the process of rebirth continues unceasingly, till purity of word, thought and deed has been reached. The soul may be purified by the doing of good, by prayer, by fasting, and even by the infliction of self-torture.

iii. **Buddhism** flourishes in parts of India, but much more strongly in Japan, China, Tibet, Ceylon, Burma, and Siam. Buddha, "The Enlightened," was the son of an Indian prince. He was born about the fifth or sixth century before Christ. Shocked by the depravity and misery of the world around him, he became a hermit, and while living in seclusion and meditation, he formulated certain principles and truths which constitute the Buddhist religion. The aim of this religion is to reach a state known as **Nirvana**, in which all desire is lost. This can only be reached by an utter indifference to pleasure and the annihilation of self. The soul is reborn again and again, until **Nirvana** is reached.

Other religions are prevalent in other parts of Asia. Thus in China we have the State religion of **Confucius**, whose central maxim was "What you do not wish done to yourself, do not do to others," in Japan **Shintoism** is the dominant religion with the simple creed of loyalty to the Emperor, passionate affection for Japan itself, respect for age, and the worship of ancestors.

The tribes of Siberia and Central Mongolia, and the Kirghiz of the steppes remain in complete heathenism.

REVISION EXERCISES

1. Upon what principles does the formation of the tides depend? Describe the differences between tidal phenomena (a) in the open ocean, (b) in shallow seas, (c) in estuaries. O. S., 1896.
2. Give the positions of the following places, stating for what each is noted: Benares, Cawnpore, Hankow, Kandahar, Mandalay, Tashkent, Tientsin, Wei-hai-wei. When it is noon at Greenwich, what is the time at Madras, and at Tokyo? C.J., 1906.
3. Asia is mainly taken up by four great empires, the British, Chinese, Russian, and Turkish. Explain by a sketch-map in what quarters these are contiguous to each other, and also what other states there are, and where situated. O. S., 1894.
4. Give a brief geographical description (naming the chief productions, and indicating the positions of the four principal towns) of the Malay Archipelago (East Indies). C. J., 1906.
5. Describe the position, surface-relief, and climate of the plateau of Iran. By what race is this region inhabited? State what you know of their language, religion, and occupations. O. S., 1906.
6. "The people of India may be roughly divided into two great sections." Explain this statement. O. J., 1907.
7. State what you know of the chief religions professed by the peoples of Asia, and describe shortly their distribution. O. S., 1907.

Footnotes.—For a short account of Buddhism in Siam, the last independent purely Buddhist country, see *The Kingdom of the Yellow Robe*, Young.

A series of most interesting books, suitable for reading in connexion with this section, have been recently published under the title of *Peoples of Foreign Lands* (Black). The series includes India, Japan, and Siam. Other volumes deal with the chief countries of Europe—Holland, France, Italy, etc.

AUSTRALASIA

CHAPTER XXIV

POSITION AND SIZE

THE last section of this book deals with Australasia. The word "Australasia" means "Southern Asia"; but there is no connexion whatever between the two continents of Asia and Australia, and their characteristic plants and animals differ very much from each other. The term "Australasia" is generally applied to that division of the world which includes the "continent" of Australia, and the Pacific or South Sea Islands of Polynesia, of which the principal are New Guinea, New Zealand, Tasmania, New Pomerania, New Mecklenburg, New Caledonia, New Hebrides, Solomon Islands, Fiji Islands, and the Hawaii or Sandwich Islands. Australia, though an island, is large enough to be called a continent. New Guinea is the second largest island in the world. New Zealand includes North Island, South Island, Stewart Island, and a number of outlying smaller islands, the chief of which are the Chatham, Auckland and Kermadec Islands.

Examine a map of the world. In what hemisphere does Australasia lie? Is it north or south of the Equator?

Examine a map of Australasia and Polynesia. Make lists of the various islands, arranging them in groups, and state which belong to Great Britain, France, Germany, and the United States respectively.

What archipelago lies between Australia and Asia? What separates Australia from (a) New Guinea, (b) Tasmania, (c) New Zealand? What oceans wash the shores of Australia?

Between what parallels of latitude and meridians of longitude do the following places lie: New Guinea, Australia, Tasmania, New Zealand?

In what directions with regard to Australia do the following places lie : New Guinea, Tasmania, New Zealand, the Fiji Islands ? In each case give the shortest distance between these places and the continent.

The area of Australia is 3,000,000 square miles. Draw a series of rectangles, as explained in Chapter XI, to show the comparative sizes of the several continents.

Draw on a blank map of Australia two circles, each with a radius of 1,500 miles. Let a part of the circumference of one circle fall on the west coast and a part of the circumference of the other circle fall on the east coast. On the same map draw a line inland, parallel to the coast, at a distance of 500 miles. Is there much land more than 500 miles from the sea ?

What parts of Australasia lie nearest to the Equator ? What parts are crossed by the Tropic of Capricorn ? What parts lie (a) within the Tropics, (b) outside the Tropics ?

How far is it from Cape York to Wilson Promontory (lat. $1^{\circ} = 70$ miles), and from east to west along latitude 27° S. (long. $1^{\circ} = 60$ miles) ? What is the length of the longest line that you can draw in New Zealand ?

Notice the compact shape of Australia and the general absence of deep inlets of the sea.

Examine a globe and say what parts of Europe are opposite to New Zealand on the other side of the globe.

REVISION EXERCISES

1. The result of a cricket match played by an English team at Melbourne in Australia (longitude about 145° E), which only finished at 6 p.m., was known here early in the same afternoon. Explain this.

Explain the following terms : delta, watershed, longitude, antipodes. State very briefly what you know of the Trade winds in the Atlantic.

C. J., 1895.

2. What British possession is nearest to the antipodes of Ecuador, and what is the antipodes of Calcutta ?

A ship which sails from London to New Zealand round the Cape of Good Hope makes no change in its calendar, but while returning to London round Cape Horn the calendar is altered by one day so as to agree with the English reckoning. Why is this done ?

C. J., 1888.

3. On a map of Australia and Tasmania mark the states of New South Wales, Queensland, South Australia, Victoria, and West Australia, drawing their boundaries ; the courses of the rivers Darling, Murray, Tamar ; Lake Torrens ; the Australian Alps ; and the following places and no others : Adelaide, Ballarat, Brisbane, Hobart, Melbourne, Newcastle, Perth, Port Darwin, Somerset, Sydney.

C. J., 1888.

4. What are the chief articles of commerce between England and India? Name the principal races and religions of India. Why is the eastern coast of that country particularly liable to famine?
C. S., 1890.

5. Explain why China is regarded as being of vast commercial importance.
O. J., 1901.

CHAPTER XXV

SURFACE

AUSTRALIA is the oldest of all the continents, and its mountain tops were lifted high above the waters at a time when the Alps and the Himalayas were under the sea.

Examine a physical map of Australia. What parts of the country are over 3,000 feet, from 1,200 to 3,000 feet, from 600 to 1,200 feet, from 0 to 600 feet, below sea-level? Answer the same questions for Tasmania, New Zealand and New Guinea.

The three main surface-features of Australia are (1) the Eastern Highlands, (2) the Central Plain, and (3) the Western Tableland. The first, known generally as the **Great Dividing Range**, rises abruptly from a narrow well watered and well timbered coastal plain. It traverses the entire continent from north to south—over 2,000 miles—and then sweeps westwards through the centre of Victoria. A southern spur once connected it with the present island plateau of Tasmania, now separated from the mainland by the shallow Bass Strait. On the landward slope of the Great Dividing Range, the ground sinks gradually down to the extensive **Central Plain**, a hot, dry, and almost treeless region; and then rises almost imperceptibly into the Western Tableland. This tableland on the west drops suddenly to a narrow coastal plain, and on the south ends in a cliff escarpment 200 to 300 feet high. South of the Central Plain lie the South Australian Highlands, running north and south.

The Great Dividing Range has various names in different parts. Name them from the map. What rivers run through the Central Plain? Find and name the following ranges: (i) a range lying along part of the north boundary of South Australia; (ii) a range running north from Spencer Gulf; (iii) a range running along the south-west coast of Australia.

There are no active volcanoes in Australia.

Let us consider the surface of each of the chief divisions.

Victoria.—A glance at a physical map will show that the surface of this state is divisible into three distinct regions. (i) The coastal plain. What inlet breaks this plain into two portions? The plain is fertile, as it is largely composed of decayed volcanic rock. West of Melbourne there are many extinct volcanoes, whose old craters are still surrounded by pumice and lava. (ii) The mountain district formed by the south-western prolongation of the Great Dividing Range, rising steeply from the coastal plain at a distance of 50 to 70 miles from the sea. Name those parts of the range that are in Victoria. The loftiest and most beautiful sections of this range are found in the extreme east. The Dividing Range divides the state into two parts, but there are deep transverse valleys, which allow communication between the northern and southern parts. (iii) The inland river plains which slope down from the mountains. What rivers drain this plain?

New South Wales.—The arrangement of the surface resembles that of Victoria. There are the three same distinct divisions. (i) The coastal plain. This is hot and moist, and contains low densely-wooded hills. (ii) The mountainous country formed by the Great Dividing Range. This is temperate and wet. The distance of the range from the sea varies from 30 to 120 miles. The mountains are below the line of perpetual snow, though on the highest peaks of the Australian Alps snow sometimes lingers throughout the year; the scenery is diversified and often of great interest, owing to the number of ravines and waterfalls. Name the several parts of the range lying in this colony. What range lies behind Sydney? It is the favourite holiday resort of the inhabitants of this city. In what direction does the Liverpool Range run with regard to the nearest ranges? Find Mount Kosciusko (Mount Townsend). This is the highest point in the continent, although it is only 7,300 feet high. It lies in the Australian Alps. (iii) The western plains, sloping very gradually to the south-west, and on which sheep and cattle graze in thousands. These plains are almost

treeless, and possess only a small rainfall, so that in many parts the rivers are generally dry, or at most contain water in isolated pools. The absence of water is partially overcome by the extensive use of artesian wells. Name the rivers flowing through these plains.

Queensland resembles the two former states in the arrangement and character of its surface. Name the three areas into which the surface may be divided. Notice the greater width of the mountainous area, and the way in which the Great Dividing Range breaks away from the coast. Name the chief parts of the range.

South Australia.—This is a land of extensive low-lying plains with some dry and arid regions in the western portion of the state, and numerous extensive and shallow salt lakes in the centre—one lake, Eyre, being actually below sea-level. Name the ranges comprised in the South Australian Highlands in the south-east of the state, and state the arrangement of the surface features from an examination of the physical map.

Western Australia generally possesses narrow low-lying coastal plains succeeded by low ranges, which mark an older coastline. Above these rises a vast elevated plain or tableland, occasionally broken by ranges or isolated hills of no great height, with numerous chains of salt lakes or swamps occupying the valleys. Much of the interior is arid owing to the scanty rainfall and absence of running water. The principal range flanks the tableland on the south-west: name it and any other important ranges you can see on the map.

Tasmania has been called the "Switzerland of the south," and the name serves to indicate the character of the scenery and the surface of the land. In the centre there is a high plateau which slopes steeply on all sides except to the south. It contains a number of beautiful fresh-water lakes. Name any high peaks that are marked on your maps. There are no continuous ranges, and the mountain valleys run in all directions. There is practically no plain-land.

New Zealand.—Is there any wide interior plain as in Australia? Beginning in South Island, in which direc-

tion does the backbone of the island group run? It may be said to end at East Cape, in North Island. Near which coast does it lie, (a) in South Island, (b) in North Island?

In South Island there are no active volcanoes, but in North Island there are active volcanoes, geysers, and boiling springs. In what parts of the two islands do the plains lie? In which of the islands is the average height of the mountains greatest?

The Southern Alps have a heavy snowfall, and many of the highest peaks rise above the snow-line. Hence these mountains contain large glaciers and fresh-water lakes. The culminating peak (the highest mountain in New Zealand) is Mount Cook. The outlying ranges of the Southern Alps cover the greater part of South Island, but in the centre towards the east coast lies an extensive and fertile plain. What is its name?

The mountains of North Island are chiefly of volcanic origin. There are over sixty cones and craters in the neighbourhood of Auckland alone. Pumice stone, lava streams, and heaps of cinders are abundant. Name the chief ranges. Find the positions of the following volcanoes: Ruapehu, Tongariro, and Ngauruhoe. Tongariro has three craters and is still active. Mount Egmont is a snow-capped, extinct volcano. On the central tableland is Lake Taupo, the largest lake in New Zealand. What river drains it?

Along the banks of this river there are numerous geysers. As many as seventy-six separate clouds of steam can sometimes be seen from a single point. North of Lake Taupo is the Hot Lake District, where there are geysers, mud volcanoes, and other evidences of volcanic action. What often appears as solid earth is nothing but a crust of earth, beneath which there are large reservoirs of boiling mud.

New Guinea.—Where does the low-lying land exist? The interior of this island is very mountainous, and some of the peaks rise above the snow-line, to a height of from 16,000 to 18,000 feet. Fear of the natives and of the climate have so far prevented extensive explorations, but the climate is not notably unhealthy though there is a certain amount of fever in the marshy parts, and several recent exploring expeditions have reported very well of the natives.

REVISION EXERCISES

1. Draw small sketch-maps of the following, and indicate the relief by contour lines for every 100 feet : (a) A volcanic cone, the base of which is at an altitude of 1,000 feet, and the crater at the top 600 feet higher. (b) An estuary surrounded by cliffs rising to over 500 feet on all sides, and containing two rocky islands, one rising to 150 feet, and the other to 250 feet.

Civil Service, Supplementary Clerks' Exam., 1907.

2. Describe precisely the position of five of the following towns and point out what geographical conditions may have helped to make each of the five important : Calcutta, Delhi, Denver, Karachi, Peshawar, Poona, Boston, Galveston, Pittsburg, Toronto, Vancouver.

Civil Service, Supplementary Clerks' Exam., 1907.

3. On a map of Australia insert the Murray, Darling, Australian Alps, Cape York, Port Phillip, the political divisions of Australia and their boundaries, Newcastle, Ballarat, Brisbane, Perth, and number the four lines of latitude and longitude nearest to the coasts of Australia.

O. J., 1898.

4. Describe the general physical characteristics of Australia.

O. J., 1891.

5. What land is there in the Southern Hemisphere ?

O. J., 1891.

CHAPTER XXVI

RIVERS

EXAMINE a physical map of Australia. Note the absence of long rivers everywhere except in the south-east. As we shall see presently, the rainfall in this continent is scanty, and therefore the river systems are not many or extensive. Next, notice the position of the main watershed. Near which coast does it lie ? What will be the character of the rivers flowing east from it ? The rivers which flow to the west are much longer than those that flow to the east, but they have only a poor supply of water. Nearly all the rivers in Australia suffer either from sudden and violent floods, or from long periods of drought. In dry weather, they speedily lose their water under the blazing heat of the sun, and are either completely dried up, or else become a mere chain of pools and ponds. As soon as the rain returns, floods ensue and the swollen streams hurry seawards with great velocity, bearing along trunks of huge trees and masses of rock. The only permanent streams of any importance are the Murray and some of its tributaries, and

their volume varies very considerably from one year to another, according to the amount of the rainfall. Thus it will be seen that the rivers of this continent are of little value for navigation. On the other hand, they are extremely valuable for irrigation, for they carry with them much alluvial matter.

The Murray-Darling river system. In what range does the Murray rise? On which side of the range? Near to what high mountain? About 150 miles from its source, at the town of Albury, the river becomes navigable for steamers of shallow draught. In what direction does the river flow beyond Albury?

Between what two states does it form the boundary? What tributaries does the Murray receive on the right bank? Shortly after its junction with the Darling, into what state does it enter? In what direction does the river turn abruptly at Morgan? Here ships from the interior discharge their cargoes, and send them on by rail to Adelaide. The river flows next through gorges, cut like terraces in the limestone rocks. Through what lake does the Murray pass before it reaches the sea? This lake is the largest fresh-water lake in Australia, and is a shallow expanse of water which is difficult to navigate. The escape from the lake is by a narrow tumultuous stream, which is impassable to steamers. The absence of a useful outlet to the sea is one of the great drawbacks to the navigation of the Murray.

In what ranges do the Darling and the Murrumbidgee rise? What states do they flow through? The slope of the plains through which these rivers flow is so slight that very often there is a fall of only 6 inches in the mile, so that during very heavy rains the country is flooded for miles. The Murrumbidgee is navigable to Wagga-Wagga, and the Darling to Bourke.

Rivers flowing to the Pacific Ocean.—Burdekin, Fitzroy, Burnet, and Brisbane. In what range do they rise? Through what state do they flow? They are all navigable for steamers of considerable size for some distance inland. They are all short, but are never completely dried up. The mouths are generally impeded

by bars formed by the sediment brought down from the mountains. The rivers are subject to floods which do great damage. In February, 1893, all the low-lying districts round Brisbane suffered from this cause. There had been exceptionally heavy rains; all the streams overflowed their banks, and miles of country were covered with a sea of muddy water, which rushed along, sweeping away bridges and houses, and causing much loss of life.

Clarence, Hunter, Hawkesbury.—In what range do they rise? What colony do they drain?

Rivers flowing to the Indian Ocean.—These are small, and often completely disappear. The chief is the Swan, but for steamers this is not navigable beyond Fremantle. Only small boats can get up to Perth. Name a few of the other rivers on this coast.

Inland Drainage.—The centre of the inland drainage area is Lake Eyre, which lies in a depression actually below sea-level. What rivers flow into this area? Most of them are often quite dried up. The lakes, which are salt, shrink in the summer to mere swamps. Make a list of all the large lakes in South Australia. The chief service rendered by these lakes is that they temper the climate of the surrounding country.

Tasmania.—Tasmania has an abundant rainfall and possesses numerous rivers.

The Derwent (130 miles) is the longest river in Tasmania. On it stands Hobart, the capital and seat of government of the state. The harbour is one of the most picturesque, and one of the finest, in the Southern Hemisphere.

The Tamar is a tidal river. The chief town upon the Tamar is Launceston, the second largest town in the island.

New Zealand.—The rivers of New Zealand are of little commercial importance, owing to the position of the watershed with respect to the island.

Clutha is the largest river in South Island. What lakes does it drain?

Waikato is the largest river in North Island. What lakes does it drain? The Waikato is navigable by small steamers for 75 miles and its tributary for another 20 miles.

The lakes of New Zealand are of considerable interest.

Those in North Island are of volcanic origin, while those in South Island owe their origin to glacial action.

In this Land of Lakes there are—"lakes everywhere, of all sizes and contours, from Wakatipu's glorious serpentine of deep-blue water, 50 miles in length, to the countless, lonely, pure cold tarns that nestle in the arms of the mountain. Wakatipu, walled by towering peaks of jagged outline and gloomy grandeur, is the best known and most accessible of the Southern Lakes. Westward again are even more beautiful lakes, queened over by many-islanded Manapouri and Te Anau, on whose deep waters one might cruise for days and days, and ever discover fresh scenes to delight the eye—winding fjords bounded by mile high mountain summits, romantic islets wooded to the water's edge, waterfalls beyond count leaping down from cloud-wrapped pinnacles, dense forests of tropic luxuriance, rich in ferns and orchids, and peopled by curious birds" (*Australia "To-day"*).

In North Island is Lake Taupo, to the north of which lies "The Hot Lake District." The largest lake is Rotorua. The natives use the hot water of this district for practical purposes. "They cook their crayfish and white fish, which they catch in the lake, in them; they boil their cabbage, they wash their clothes in them; and they wash themselves. They dig out baths, bring streams from cold springs to temper the hot, and pass half their time lounging in the tepid water. I heard a grunt as I passed one of these pools. I supposed it was a pig. Looking round, I beheld a copper-coloured face and shoulder, a white head, and a pipe sticking out of the mouth" (*Oceana*, Froude).

New Guinea.—New Guinea has an abundant rainfall, and therefore many streams, but little is known of them, and they are at present of no commercial value. The largest river is the Fly River, which drains much of the middle of the island, and has been ascended for over 500 miles.

REVISION EXERCISES

1. On the accompanying map (Fig. 55) trace the course which you think the rivers would follow. C. J., 1900.
Draw a section from A to B.
2. Describe the positions of the Bolan Pass, Goa, Labuan, Manilla,

Sakhalin, Tsu-shima, Vladikavkas, and name the country to which each belongs. Name three large lakes in Asia, one of fresh water and two of

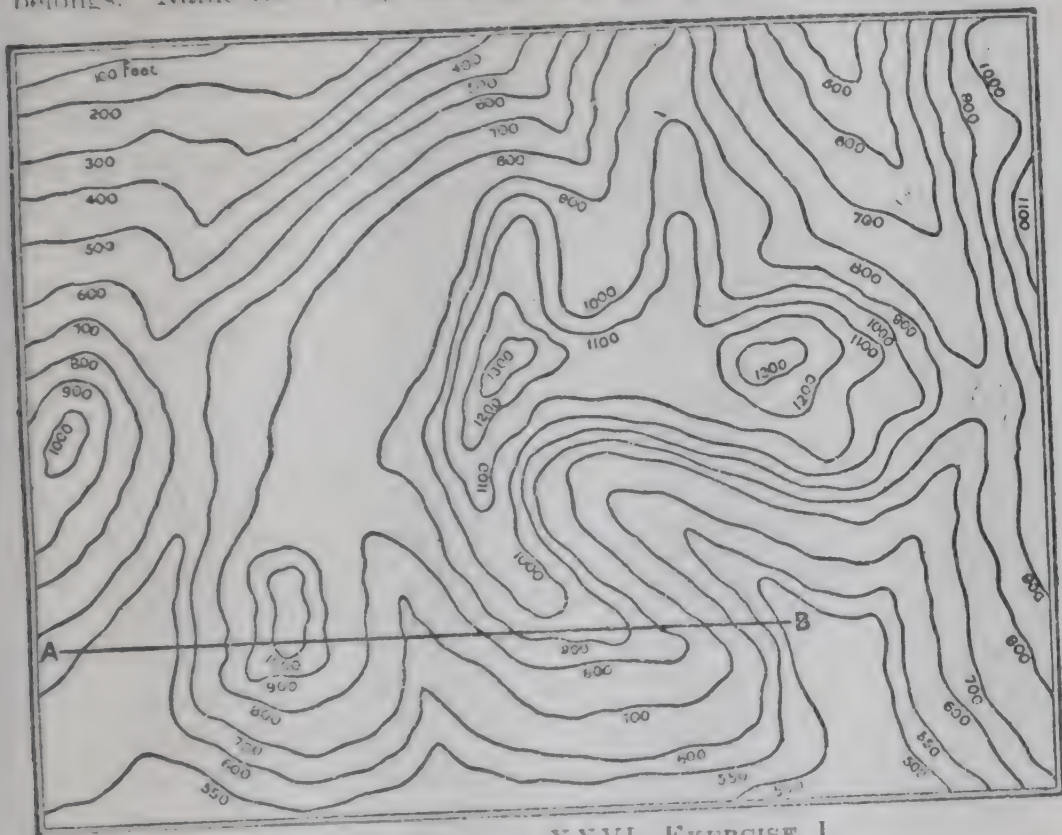


FIG. 55.—CHAPTER XXVI, EXERCISE 1.

salt water, and account for the difference in the character of the water. C. S., 1906.

3. Draw a map showing the chief rivers and mountain systems, with their names, of the south-east of Australia. Mark and name three towns on the coast. L. J. S., 1907.

CHAPTER XXVII

THE COAST

FIND Cape York. Follow the east coast. In what direction does it run almost to latitude 30° S.? Notice the large number of little bays and capes, and of small islands off the coast. What mountains would be seen by a ship sailing along this coast? What river enters the sea about latitude 19° S.? What important line is crossed? What rivers run into

the sea where this line cuts the coast ? What do you notice about the width of the continental shelf between Cape York and latitude 25° S. ? The edge of this is marked on the map as the **Great Barrier Reef**. This reef is a belt of coral reefs and atolls. It is narrow off Cape York, but is nearly 70 miles wide off the mouth of the Fitzroy. The total length is about 1,400 miles. The Great Barrier Reef acts as a huge breakwater, and the sea between the reef and the mainland is generally calm. The channel, however, is difficult to navigate, on account of the sunken rocks, and ships using this passage usually anchor at night. Opposite the mouths of the larger rivers there are passages through the reef, for the coral polyp cannot live in dirty water.

From the mouth of the Fitzroy River to Cape Byron, and then on beyond as far as Cape Howe, the coast is rocky and broken by a number of fine harbours. The coast of New South Wales has bold rocky headlands, with intervening sandy bays. These bear such a marked resemblance to those of Wales, that their discoverer, Captain Cook, named this part of the country by the name which it bears to this day. The finest of the New South Wales harbours is Port Jackson, on which Sydney stands.

In what direction does the coast turn at Cape Howe ? What do you notice about the width of the continental shelf between Cape Byron and Cape Howe ? Name the ranges of mountains that are near the coast between these two capes. What large island lies south of Victoria ? What strait separates the island from the mainland ? Is the island on the continental shelf or not ? What is the general shape of the island ? The north coast is only broken by one inlet. What river forms this ? The west of the island is bold and rocky, and the east rather resembles the west of Scotland, in the number of its branching inlets and numerous islands. What cape is at the southern end of the island ?

The most southerly point in Australia is Wilson Promontory. What large inlet lies west of this point ? What large openings are there in the south of South Australia ? Which of these receive the waters of the Murray ? What island lies at the entrance to the Gulf of St. Vincent ? From

Spencer Gulf westwards there is a wide incurve. What is it called? What rivers flow into it? The coast is lined for 1,000 miles with an unbroken wall of white limestone cliffs, whose average height is about 500 feet. What do you notice about the width of the continental shelf? What inlet is there in West Australia in latitude 35° S.? From this place the coast begins to run northward.

In the south-west corner of the continent is Cape Leeuwin, a bold rocky headland, and the first land sighted by vessels coming towards Australia from the west. Cape Leeuwin stands at one corner of a peninsula. What cape stands at the other? What bay lies on the north of the peninsula? What mountains lie near the coast? By what river mouth is the coast-line broken? In what direction does the coast run from this river to Steep Point? Steep Point is the most westerly cape in the continent. What island lies just north of this point? What bay lies between the island and the mainland? This bay has a valuable pearl fishery. What do you notice about the width of the continental shelf between Steep Point and Cape Naturaliste? In what direction does the coast run from North-West Cape? The greater part of the west coast, from Cape Leeuwin to about latitude 15° S., is low and monotonous, and blocked by coral reefs and islands. Navigation is dangerous owing to the shallow water, the violent summer storms, and the many cross currents.

What northerly projecting peninsulas break the north coast? What gulfs are marked on your map as being on the north coast? What island lies to the north-west of Arnhem Land? A magnificent harbour has been discovered here. Notice the width of the continental shelf along the north coast. Trace out the position of Wallace's Line with regard to this shelf. What large island lies on the edge of the continental shelf? This vast island is one of the least known parts of the world. What is the sea called between this island and the mainland? What is the name of the strait between the island and Cape York? In this strait is Thursday Island, and near to the island there is one of the few safe channels by which ships can pass through the strait. Thursday Island is used as a calling

station for passenger steamers, and as the headquarters of the pearl fishery in these waters.

The total length of the coast-line of Australia is 10,000 miles. You already know the area of the continent. Find out, therefore, the number of square miles of area to 1 mile of coast.

Which continent is the more solid and unbroken, Europe or Australia? What other continent or continents are compact in form?

New Zealand.—Does the continental shelf extend from Australia to New Zealand? Notice the variation in the width of the band of shallow water round these islands. Where is it widest, and where is it narrowest? What strait separates (*a*) North and South Islands, (*b*) South Island and Stewart Island?

What two capes are at the northern end of North Island? What two large inlets are there on the east coast? Both of these bays are dotted with islands. What is the most easterly point of North Island? In what directions does the coast run from this point? By what large bay is it broken between East Cape and Cape Palliser? Notice the shape of the coast where it is washed by Cook Strait, and also the great incurve on the west coast.

South Island has a short north coast, with many deep bays and curious peninsulas. Name the largest bay. The east coast is smooth and sandy. By what peninsula is it broken just north of latitude 44° S.? What bay is to the north of this peninsula? The south coast is subject to severe storms. Examine the south-west corner of the island, and note and account for its resemblance to the west coast of Norway or of Scotland. Between Milford Sound and West Cape "are the grandest examples of salt-water fjords in the world—thirteen in number—ranging from 10 to 25 miles in length from ocean to head, and many of them studded with densely-wooded islets. These sounds have more than four hundred miles of sheltered inner coast-line, and form noble yachting grounds."

"Only a few miles of open coast separates the various indentations, opening out into deep clefts, between the lofty snow-capped mountains. It is a stern and gloomy

country to the eye of the sailor who coasts its rock-bound precipices; but as the narrow portals of these magnificent harbours—the best on the whole west coast of New Zealand—are entered, the voyager's feelings of awe are quickly mingled with delight at the richness of the vegetation, and the myriad number of streams and waterfalls which cascade down the prodigiously high cliffs " (*Australia "To-day"*).

North of 44° S. the coast is largely unbroken, and there are practically no harbours. What mountains lie near the coast?

Australia is a big round continent with a very small proportional coast-line. New Zealand is a long narrow island with a very extensive coast-line. The total length of the coast-line of New Zealand is about 3,000 miles. No part of the islands is more than 75 miles from the sea. Cool breezes sweep over the plains and away up to the mountains, and from the summits of the higher peaks the Pacific Ocean can be seen on both sides of the island. This long coast-line has helped in developing the commercial prosperity of the country. All the cities, and most of the smaller towns are built on the coast. Unfortunately, many of the fine inlets on the west coast of North Island have been blocked up by sand, carried by the East Australian Current.

REVISION EXERCISES

1. Describe with examples the action of rivers (a) in forming new land, (b) in shaping the general surface of the country. O. J., 1897.

2. State what you know of Bangkok, Chemulpo, Hankow, Lhasa, Malacca, Nagasaki, Tientsin.

Give a short description of the Monsoons. C. J., 1906.

3. On a map of Australia insert the boundaries and names of the states, the Tropic of Capricorn, Murray, Darling, Fitzroy, Flinders, the Great Barrier Reef, Lake Eyre, Port Darwin, Perth, Brisbane.

O. S., 1893.

4. Describe carefully the different forms of coral reefs and islands. Explain how they are grouped in the Pacific Ocean. C. S., 1888.

(N.B.—Such a question as No. 4 is best answered by reference to an encyclopædia, or some textbook rather fuller of detail than this one. See *On the Use of the Library for Purposes of Reference* (Young), in "School," May, 1903.)

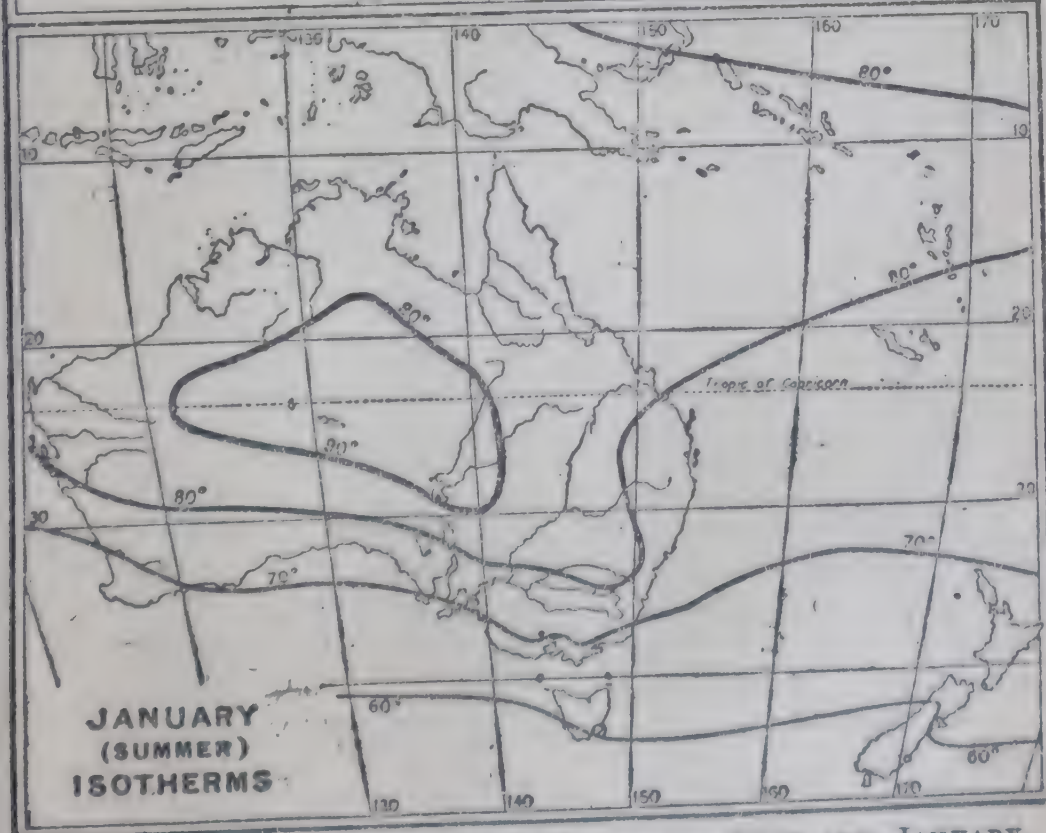
CHAPTER XXVIII

CLIMATE

FIG. 56 shows the July isotherms (reduced to sea-level) of Australasia. Where is the sun in July, north or south of the Equator? Is it summer or winter at this time in the countries north of the Equator? Will it be summer or winter in the countries south of the Equator? Is Australia north or south of the Equator? How can you tell this by the examination of the lines of latitude? Does Australia have its hottest or coldest weather in July, or in December? What other large British colony has summer and winter respectively at the same time as Australia? What large island is surrounded by the isotherm 80° in July? Notice the comparatively regular character of the isotherms 60° and 40° ? Why are they almost parallel to the lines of latitude? To what important line is isotherm 60° almost parallel? Account for the irregular character of the isotherm 50° ? Is there much of Australia which has a temperature under 60° F. in winter? Between what isotherms does Australia lie? New Zealand? What is the difference in temperature in July between Stewart Island and New Guinea? What isotherms are cut by longitude 140° W.?

Does this map indicate the effect of latitude on climate? If so, how?

Fig. 57 shows the January isotherms for Australasia. What kind of a Christmas Day would you get in the interior of Australia? Where is the sun in December? What is the temperature on the Tropic of Capricorn? What parts of Australasia now lie between the two isotherms marked 80° ? What is the difference between the temperatures in July and January (*a*) on the Tropic of Capricorn, in longitudes 130° and 150° , (*b*) in New Guinea, (*c*) near Cape Leeuwin, (*d*) near Melbourne, (*e*) in North Island, New Zealand? Arrange these places as follows.



FIGS. 56 AND 57.—AUSTRALASIA: ISOTHERMS, JULY AND JANUARY.

Place.	July Temperature.	Dec. Temperature.	Difference.

Account for the differences.

Has any part of Australasia (a) a very cold winter, (b) a very hot summer?

The temperature of the different parts of Australia depends more on elevation and distance from the sea than on the latitude. In the neighbourhood of the ocean there is no great difference between the temperature at mid-day and mid-night, whereas inland these differences are often very considerable.

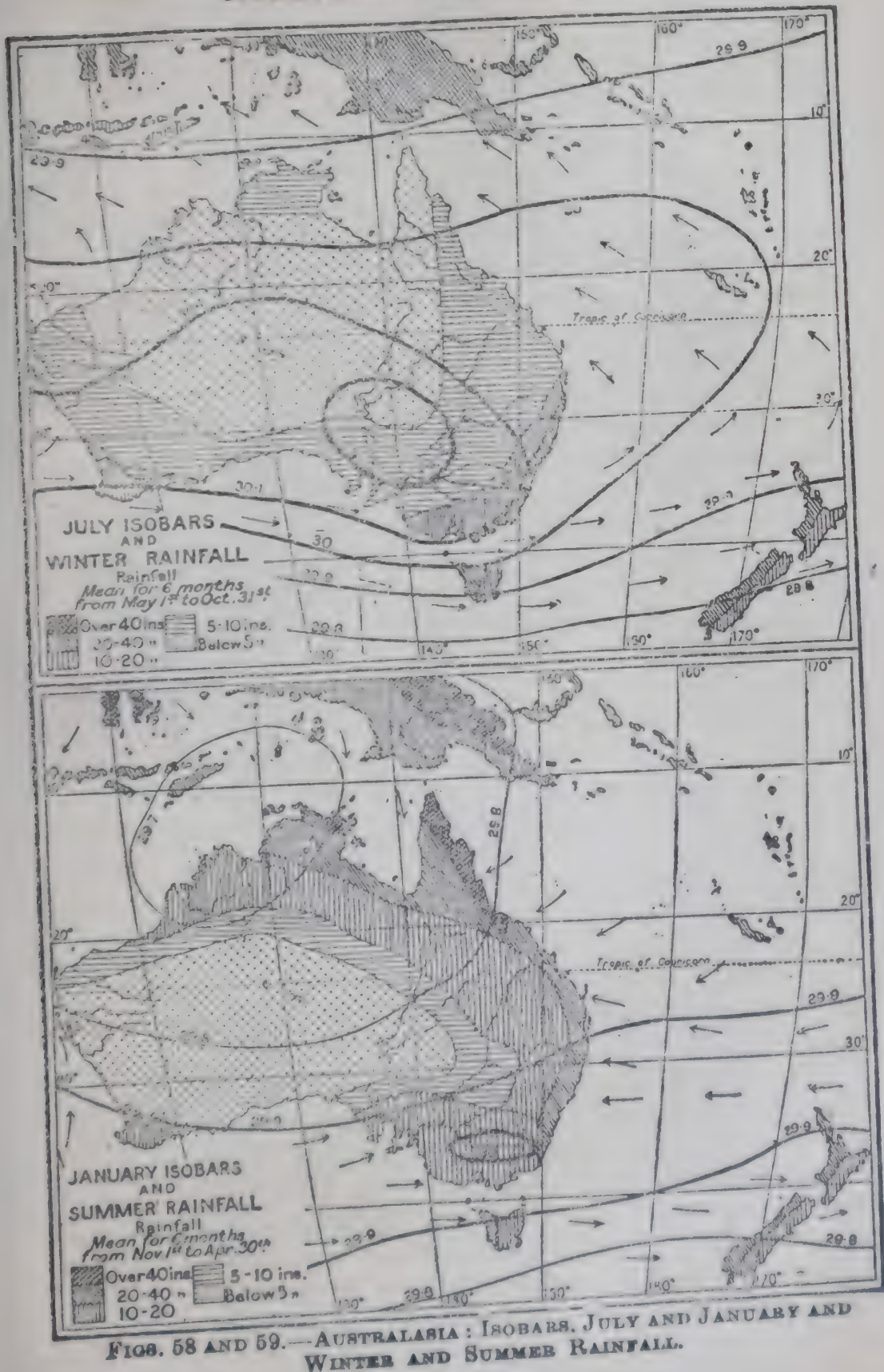
Some of the Australian states exhibit great varieties of climate. For instance, the north of Queensland is in the tropics, and has a tropical climate, but the high tableland has a cool and bracing climate.

One of the most striking features of the Australian climate is the abundance of sunshine. The sky is seldom covered with cloud for long together, and the cold grey days that are so common in England are not of frequent occurrence.

Fig. 58 shows the isobars for July. What lands are crossed by the two isobars marked 29.9? Where is the region of highest pressure in July in Australia? How is this connected with the temperature at this time and place? In which way will the air tend to move? What effect will this have in attracting or repelling winds from the sea? Will the result be to increase or diminish the rainfall in the winter?

What Trade winds are marked as blowing at this time? To which coast would they bring much rain if not repelled by the outward movement of the air over the land? What winds reach the south-west corner of the continent from the sea? Are these wet or dry winds?

What winds blow towards New Zealand and Tasmania? Which sides of these islands will naturally be the wettest at this season?



FIGS. 58 AND 59.—AUSTRALASIA: ISOBARS, JULY AND JANUARY AND WINTER AND SUMMER RAINFALL.

Fig. 59 shows the January isobars for Australasia. Where is now the area of lowest pressure? What winds blow towards this area? Where is the region of highest pressure? At this time, owing to the great heat, the pressure in the interior of the continent is much reduced and the winds from the sea can reach much further inland. Will the rainfall be heavier or lighter in December than it is in July? Name the three winds that bring rain to Australasia at this time. Which coasts are affected?

Occasionally hot winds from the interior, known as

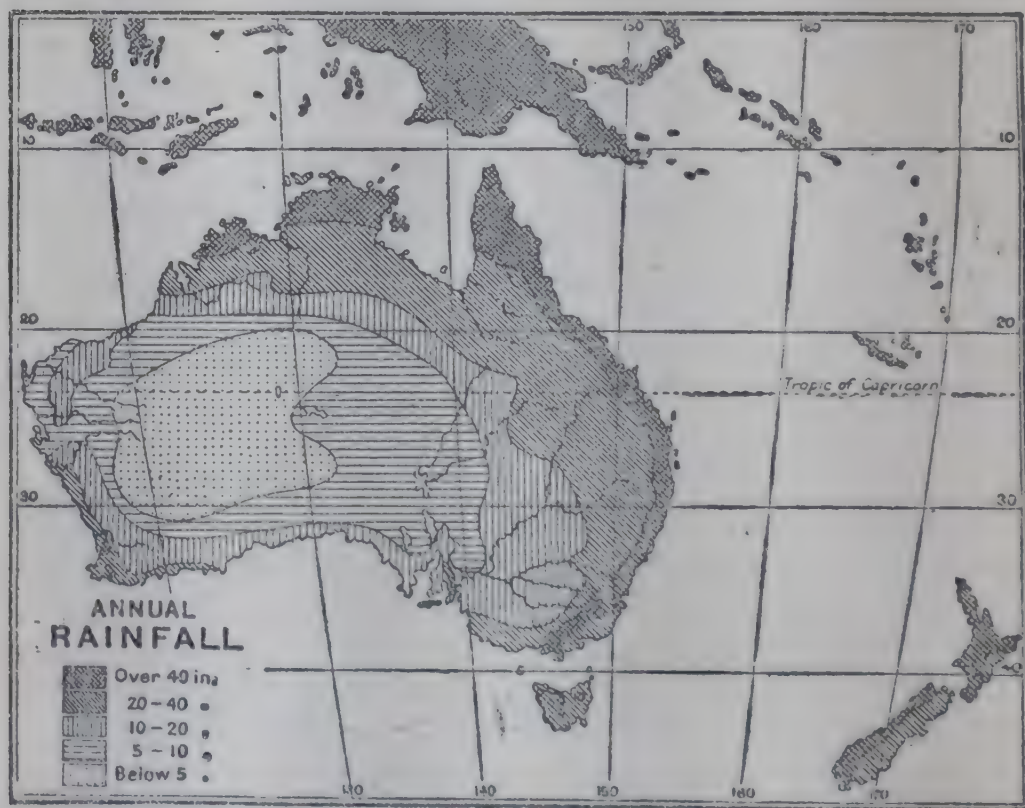


FIG. 60.—AUSTRALASIA: MEAN ANNUAL RAINFALL.

“brick-fielders,” blow across the south-eastern part of the continent. They are laden with dust and render life very uncomfortable while they are blowing. All doors and windows are closely fastened, and yet the dust penetrates everywhere. At such times the heat is in some places suffocating. Fortunately these winds are of short duration, and are usually followed by gentle rains.

Fig. 60 shows the annual rainfall for Australasia. Name

the wettest parts. Account for them, stating what winds bring rain, and what hills or mountains cause the condensation of the vapours brought by these winds? If Australia had her mountains in the centre of the island, instead of on the coasts, what differences would you expect to find in the rainfall? Notice the heavy rainfall in Queensland. What winds reach the interior? What hills condense the vapour? The winds blow across the warm East Australian Current, and so are not only warm but moist. On the west of the Great Dividing Range there is a rainfall of over 24 inches. What rivers are fed by this rainfall? What is the annual rainfall on the south-west corner of Australia, of the basin of Lake Eyre?

Victoria has the most temperate climate of any state in the continent. How do you account for this? In the Wimmera District the rainfall varies from about 20 inches in the west to over 22 inches in the east. This rain is particularly useful to farmers, as it falls chiefly in the spring.

Through how many degrees of latitude do South Australia and the Northern Territory extend? In the latter the climate is tropical and there are alternate wet and dry seasons with a heavy rainfall. The centre of South Australia is very dry, but the heat is somewhat tempered by the height of the ground above sea-level. The south of the state receives very hot winds from the north during the summer, and at intervals of about eleven years there is a period of great drought. The winter rainfall at Adelaide is about 21 inches, and the south-east winds give this part of the colony a beautiful spring and autumn climate.

West Australia has a similar series of climates: (i) Tropical, hot, and dry, in the north; (ii) healthy, pleasant, and abundant winter rainfall in the south.

Tasmania has an equable climate. The west winds and the East Australian Current are responsible for a constant supply of moisture which is condensed by the high interior.

New Zealand has a maritime climate. Auckland has the greatest average heat, the least range of temperature, and the most even distribution of rain. New Zealand, unlike Australia, never suffers from drought. The failure of the water supply in Australia is always attended by the most

serious consequences, for the grass withers, and the sheep, which constitute so large a part of the wealth of the country, perish by the thousand.

REVISION EXERCISES

1. Mention examples of regions which have a large rainfall (over 70 inches per annum). What explanation can you give of each example ?

O. J., 1903.

2. Describe the position of French Indo-China. What are its chief divisions and towns ? Give some account of its products and trade.

O. J., 1906.

3. Draw a map of Australia, shading the high land (say over 3,000 feet), showing the courses of four of the most important rivers, and inserting and naming a town on each. Write "rainy" across the rainiest part of the continent.

L. J. S., 1905.

4. Describe shortly the distribution of rainfall in Australia. What are the three main winds from which the rainfall is derived ?

O. S., 1906.

5. What part of Australia is not drained by rivers flowing to the sea ? State the nature of the climate of this region, and name and describe very briefly the chief river of the inland drainage area.

L. J. S., 1906.

6. What part of Australia has the most abundant rainfall, and what is the character of the interior of the continent as regards rainfall and drainage ?

Account for the violent changes of temperature that sometimes occur in South Australia.

C. S., 1889.

7. What kind of climate would you expect to find at Christmas Day in (a) the Middle (South) Island of New Zealand, (b) north of Queensland, (c) Cape Town, (d) Durban, (e) Singapore, (f) Quebec ? Give reasons for your answer.

L. J. S., 1905.

CHAPTER XXIX

VEGETATION

FIG. 61 shows the distribution of vegetation in Australasia. Compare this with the map showing the annual rainfall and notice the remarkable resemblance in the shapes of the shaded areas in the two maps.

Where is the desert area ? What is the annual rainfall there ? Where is there an area of woodlands ? What is the amount of the rainfall in this area ? Notice the belt of open grass-land that almost surrounds the interior. What is the average rainfall ? In what islands, or in what parts of the continent are forests marked ? Where are the areas of heaviest rainfall ?



FIG. 61.—AUSTRALASIA: VEGETATION.

Fill up the following table by reference to the maps already given, and to the maps in your atlas.

Area of Vegetation.	States and Colonies partly or entirely covered.	Average Rainfall.
Desert		
Woodlands		
Open grass-lands		
Forests		

Roughly speaking, we have (i) a dry interior where only plants of a desert or semi-desert character can grow, owing to lack of rain; (ii) a belt of grass-land where the rainfall is moderate; (iii) a belt of forest, where the rainfall is very abundant. These are not regular concentric areas, as you can see by an examination of the figures given, but in a general way, the statement made above will help you to map out the areas of natural vegetation.

Most European food plants and fruits are now successfully cultivated in some part or other of the continent, or in the adjacent islands, and the exports of such commodities as fruit, wine, and wheat are of great value.

Let us first examine the distribution of natural vegetation. This may be roughly divided into three classes.

i. **Scrub Lands.**—The scrub lands lie mostly in the interior, though in parts of the far interior there is practically no vegetation at all. Wherever, in these dry areas, plants are found, they are of a desert or semi-desert character. The want of water is fatal to all plants that cannot withstand drought, and prevent the loss of their moisture through excessive evaporation. As a means of avoiding loss of moisture, some of the plants turn their thin, instead of their flat edges towards the sun; others have thick leathery leaves; others secrete oil. Some of the trees and plants have long roots that go down deep into the ground in search of moisture, so that they are able to obtain water at great depths. The name "scrub" is applied to any scanty, dwarf-growing, stunted vegetation, and even to under-woods.

Mallee Scrub consists of a dense cheerless thicket of a dwarf species of eucalyptus about 8 to 10 feet high. The plants grow so closely together that the scrub is almost impenetrable. Thousands of miles of this tangled growth are to be found in South Australia and Victoria. In the Wimmera District (north-west of Victoria), the scrub has, however, been crushed with a roller and then burnt, thus clearing the ground, and allowing of the cultivation of wheat.

Mulga Scrub is composed of thorny acacias, and is more feared by the explorers than the mallee scrub, as the short sharp spines which the acacia bears, tear both the clothes and the flesh of all those who try to traverse the area where the plant grows.

Spinifex is the dreaded porcupine grass, whose leaves resemble a thousand knitting needles stuck into a large pin-cushion. The spines so wound the legs and feet of horses, that these animals frequently have to be killed to put them out of their misery. Even the hard-mouthed camel cannot eat spinifex.

ii. **Grass lands** are found on the tableland and the adjacent parts of the interior. In the districts nearer the coast, the country is covered with open park-like lands which gradually pass into the open grass-lands. Some of the native grasses are of great value for grazing purposes.

Kangaroo Grass forms an excellent pasture and is valued as fodder for stock.

Salt-bush grows on saline rocks. Millions of sheep are fed on salt-bush, especially in New South Wales. The sheep which are reared on this plant produce the finest and the densest wool. In Queensland, the most valuable indigenous vegetation consists of various grasses which are able, not merely to endure long periods of drought, but to grow again rapidly after quite a small rainfall. They grow on the west of the Great Divide and feed large numbers of sheep. Coarser kinds of grass, more suitable for horses and cattle, are found to the east of the Great Divide.

Almost half the colony of Victoria is covered with exceedingly fine grass.

iii. **Forests.**—The forest regions lie near the coasts, where there is an abundant supply of moisture. The forests of the north are tropical in character, and mangroves and other trees usually found in wet jungles predominate. In the eastern forest regions various species of eucalyptus are found; tree ferns form part of the undergrowth in the Australian Alps; jarrah, karri, and other valuable timber trees flourish in West Australia.

The characteristic trees of Australia are the eucalypti or gum trees, and the acacias or wattles. There are about 150 different kinds of gum trees, most of them not found in any other continent, and some of which are valuable as timber.

Blue Gum. This is the species of eucalyptus from whose leaves is distilled the pungent eucalyptus oil.

The **Peppermint Tree**, another species of eucalyptus, found in Victoria and West Australia, is the tallest tree in the world, overtopping even the mammoth trees of California. One fallen tree was found which measured 480 feet.

The **Peppermint Tree** is purely coastal, and is seldom seen further inland than 15 or 20 miles. The timber is

hard and durable, and makes an excellent firewood. The leaves, when crushed, emit a strong perfume resembling peppermint, hence the name. The oil distilled from the leaves possesses strong antiseptic properties.

The **Black Wattle** is a species of acacia, the bark of which is employed in tanning. As tannin-bearing trees are somewhat scarce in parts of the continent, the cultivation of this tree has become a well-established industry.

Red Cedar, often attaining a height of 130 feet, and a girth of 30 feet, is found in the "brush" forests along the coast.

Jarrah is, without doubt, the most valuable tree in the forests of West Australia. It is a species of eucalyptus, and a good healthy specimen will run from about 90 feet to 100 feet in height. The jarrah is not found beyond the influence of the sea, and yet direct sea breezes do not seem to suit it. The best forests are found from 20 to 30 miles off the coastal line. In all cases the tree delights in an iron-stone formation, and the rougher the site, and the more barren it is of other vegetation, the better the tree will grow. Jarrah is the best known of all Australian timbers, and is exceedingly valuable on account of its hardness and durability. Some of the principal uses to which it is as yet applied are : wooden blocks for street paving, piles, jetties, bridges, boat-building, furniture, railway sleepers. It makes the best charcoal of any timber in the state.

Karri.—This is the giant tree of Western Australia, but it is not so well known as the jarrah, on account of the limited field of its growth and, at present, the comparative inaccessibility of its haunts. Karri is a species of eucalyptus. The forests lie in the well-watered district round Géographe Bay, and are estimated to cover an area equal to that of Great Britain. The trees are almost always of straight growth, and tower skywards for great heights without having even the semblance of a branch. So marked are they in these respects that they look like a mass of upright candles. The wood is used for the same purposes as jarrah, but for wood-paving it is preferable, since its surface does not become so slippery

when exposed to heavy traffic. As is well known, this timber is largely exported for the paving of London streets.

The Grass Tree has a ragged stem, and bears a tuft of leaves at the summit. From the centre of this tuft a bulrush kind of rod projects which bears a cluster of white flowers. On account of the resin which exudes from some of the species, they are known as "grass gum trees."

Tasmania.—The vegetation of Tasmania resembles that of Australia, and the eucalyptus is the characteristic tree. As there is no drought, and as the island also escapes the hot winds from the north, there are no desert areas.

In the forests of the south-west is found the **Huon-pine**, which supplies the finest timber for ship-building. A Tasmanian forest is not silent like those of New Zealand, nor plagued with heat and with insects, like some of those in Australia.

New Zealand.—In New Zealand we can distinguish three areas of natural vegetation.

i. **Forests.** The forests are found chiefly on the wet mountain ranges of the west. These contain about 120 indigenous trees, all of which are evergreens, and many of which yield valuable timber. North Island, though largely covered with swamps, has many fine timber forests. South Island, except in the north-east, and on the western side of the Alpine chain, is far less favoured, and most of the interior elevated plains have few trees.

The **kauri pine** is often from 8 to 10 feet in girth, and from 180 to 200 feet high. It flourishes specially in the province of Auckland. The timber is very valuable, as it produces a resin which is employed in the manufacture of different kinds of varnish. Kauri gum resembles amber in appearance, and is found in masses at the foot of the trees, or in ground from which the kauri forests have been cleared.

ii. A belt of ferns covering the lower hills. These ferns vary in size, from a mere mossy tuft to great trees with fronds 20 feet long. The fern area covers hundreds of square miles of good land, and is cleared when necessary by burning.

iii. **Grassy plains** on the west of North Island and on the east of South Island.

Along the banks of the Waikato, New Zealand flax is grown. This is exported to the value of half a million a year, and is used in rope making, as it is both tenacious and durable.

The characteristic eucalypti and acacias of Australia and Tasmania are not found in New Zealand, though they grow well enough when introduced.

New Guinea.—New Guinea is overgrown with dense forests containing trees of gigantic size, amongst which the most important are cedar, india-rubber, sandal wood, ebony, hard wood. Amongst the food plants are bananas, sago, breadfruit, coco-nut, and sugar-cane, all of which are available commercial products.

Cultivated Crops.—Australia does not possess a single characteristic food plant which is indigenous to the continent, but the soil is capable of producing every variety of plant grown in tropical or temperate regions, wherever a sufficient supply of moisture can be obtained.

Insert the names of the following crops in a map of Australasia so as to indicate the areas in which these crops are grown.

Wheat is the principal crop in all the Australian states. Enough is grown for home consumption, and there is a large surplus for export. The chief wheat districts are:—

i. South Australia. In the south of this colony there are extensive limestone plains which are suitable to wheat, and the quality of the grain grown in this area is excellent, though the yield per acre is small compared with that obtained in Manitoba.

ii. Victoria. Wheat is the chief product of Victoria and is grown on the old "mallee" country. When sufficient rain falls, many square miles of land are under cultivation. (Export in 1910 was worth £3,079,341.)

iii. New South Wales. Wheat is grown on the higher regions in the upper basin of the Murray. The rainfall is sufficient, irrigation is easily carried out, and there is good railway accommodation. (Export in 1910 was worth £2,381,142.)

iv. Tasmania has only a limited extent of agricultural ground. The best farms are situated where lava floods

have been. On the east there are sandy areas, and in the centre the plains of basalt have too thin a covering for the plough, while in the west and north there are immense trees which make clearing very expensive.

v. New Zealand on the warm dry plains of Wellington and Marlborough. "In the interior, while admirably adapted for pasturage, large areas could never be advantageously occupied by farmers. There are vast morasses, storm-swept highlands, densely-timbered lowlands, waving fern swamps, and eagle-throned mountains not acceptable to ploughmen. One region, however, will prove an exception. The centre of North Island, still wholly in native hands, though situated among lofty hills, dashing waterfalls, and roaring streams, with heavy snows in winter, and many tempestuous showers, has a soil of such rare fertility, that it must, in spite of all natural and human difficulties, be a future favourite locality for smiling homesteads" (*Australasia*, Bonwick).

Oats and Barley are most largely grown in Victoria and in New Zealand, where the moist and comparatively cold climate of Canterbury and Otago is particularly suitable.

Maize is the chief crop in Queensland, and is also an important product in New South Wales. The low alluvial lands of Queensland, between Brisbane and Rockhampton, are noted for the quantity and the quality of the maize crop. The plant also thrives in the damp heat of the low alluvial valleys on the north-east coast of New South Wales. It is also grown extensively in Eastern Victoria.

Sugar.—The cultivation of sugar-cane and the manufacture of sugar are important industries in Queensland and New South Wales. The canes grow on the hot, moist coastlands, the largest plantations being between Mackay and Townsville. Queensland supplies sugar to the whole Commonwealth.

Fruit.—The climate and soil of Australia are particularly well suited to the growing of fruit. The chief varieties grown are as follows :—

Oranges.—New South Wales, where the climate is equable and the soil fertile; Queensland, South and West Australia.

Pine Apples and Bananas.—Queensland.

Peaches and Apricots.—Victoria. The extent to which land can be rendered valuable by irrigation is well shown at Mildura on the Murray. A few years ago the place was nothing but barren soil. Now, owing to irrigation, the district is covered with orchards and vineyards, where peaches, apricots, and similar fruits are reared in abundance. These fruits are grown also in New South Wales and West Australia.

Grapes.—South Australia, New South Wales, Victoria and West Australia. The climate is favourable to the growing and drying of grapes; hence wine making and the curing of grapes for currents and raisins are important and rapidly developing industries.

Apples.—Grown in all the states in the south and east, but principally in Victoria and Tasmania. Large orchards have recently been planted in Western Australia.

Strawberries.—Victoria, New South Wales and Western Australia. Queensland produces strawberries which supply the winter markets of the south.

A list of the chief vegetable productions is given below for reference purposes only.

New South Wales.—Various species of eucalypti, acacias, red and white cedars, native beech and pine, tree ferns, palms, fig trees, wheat, maize, oats, potatoes, barley, sugar-cane, tobacco, grapes, oranges, and other fruits.

Victoria.—The indigenous plants are those of New South Wales. Wheat, oats, barley, maize, root crops, hay, English grasses, grapes, vine, olive, all the fruits of the temperate regions, all kinds of vegetables.

Queensland.—Eucalypti, acacias, red cedar, Moreton Bay pine, silky oak, beech, excellent grasses, nutritious fodder plants, maize, sugar, wheat, rice, potatoes, bananas, pine-apples, oranges, grapes, mangoes and other fruits.

South Australia.—Eucalypti, acacias, grass trees, wheat, grapes, oranges, olives, almonds.

Western Australia.—Jarrah, karri, white gum tree, blue gum tree, and other eucalypti, acacias, strawberries, apples, pears, grapes, oranges, apricots, figs, bananas.

Tasmania.—Blue gum, Huon pine, tree ferns, wheat, oats, apples, pears, figs, currants, strawberries.

New Zealand.—Kauri pine, wheat, oats, maize, English fruits and vegetables, grapes, oranges.

New Guinea.—Cedar, india-rubber, sandal-wood, ebony, hardwood, rice, maize, yams, coco-nuts, sago, sugar-cane, bananas.

REVISION EXERCISES

1. In what parts of the world is the difference of temperature between the hottest and the coldest months (a) greatest (b) least? How do you account for the facts?
L. J. S., 1906.

2. In what parts of the world are (a) cotton, (b) tea grown? Describe the climate suitable for their cultivation.
L. J. S., 1904.

3. On a map of Australia insert and name the different states and their capitals, Mount Kosciusko, the Blue Mountains, the Flinders Range, and name Cape York, Cape Leeuwin, Cape Howe, the Timor Sea, the Gulf of Carpentaria, Spencer Gulf, Torres Strait, and two rivers.
C. J., 1899.

4. In the case of any *five* of the following, state in what part of the world they are found, for what purpose they are used, and if you can add any explanations, do so: Bananas, cacao, coco-nuts, esparto-grass, india-rubber, oil-palm, olive, reindeer moss, sugar-beet, sugar-cane.
L. J. S., 1905.

5. Name the great timber producing regions of the world, stating the sort of timber grown in each.
O. J., 1898.

CHAPTER XXX

ANIMALS

OWING to the fact that Australia has been isolated from the other continents since remote ages, its native animals are quite unlike those found elsewhere. Few of them are valuable for their flesh or fur; and being incapable of domestication, they are now found only in the wild, non-settled districts and are gradually dying out.

The Kangaroo belongs to the group of animals known as the *Marsupialia*, a group, in fact, which includes all the characteristic mammals of this continent. The kangaroo has short, weak, fore-legs and strong hind-legs, so that it never runs on all fours, but hops about on its hind-legs, using its powerful tail to help it to spring. The female has a pouch in which she carries the young till they can look after themselves. The kangaroos are hunted with specially

bred dogs, and their skins are used in making a kind of leather. They are now scarce in Victoria, but still fairly common in New South Wales and Queensland.

The **Australian Opossum** lives in the branches of the gum tree, and is pursued for the sake of its skin, which is used in the manufacture of rugs.

The **Duck-Billed Platypus** is one of the curiosities of the animal world. It has thick soft fur, a bill like a duck's, webbed feet with claws, and pouches in its cheeks. It lays eggs like a bird, but suckles its offspring like a mammal. Its eggs however are soft-shelled.

The **Birds** are numerous, and include black swans; the emu, an ostrich-like bird that is gradually disappearing; the lyre bird, with a tail shaped like a lyre; the bower bird, that makes a bower, not as a nest but as a playground, arched over with grass and adorned with shells, bits of bone etc; the giant kingfisher, or "laughing jackass"; the brush turkey, which builds an incubator of leaves for the hatching of its eggs; parrots; cockatoos; and pigeons.

The **Reptiles** include lizards two yards long, found in the plains; alligators in the rivers of Queensland and other parts of northern Australia; snakes, which are so common that instruction in the best way of dealing with snake bite is given in the schools.

The **Fish** are important, as there are over a hundred different species of edible sea-fish. The schnapper, the most abundant and valuable, sometimes attains a weight of 30 lb. The Australian salmon is a very large fish, but has not the delicate flavour of the true salmon. Sea mullet, mackerel, herring, and whiting, are found near the coasts. The finest river fish is the Murray cod, a kind of perch, which sometimes weighs as much as 100 lb. Oysters, both edible and mother of pearl, are plentiful and excellent.

Amongst the curiosities are the frog-fish, that walks rather than swims; the hopping fish; the dugong, which, though it lives in the water like a fish, has a stomach like an ox, and eats grass and grain. The dugong, which is seldom seen south of the River Brisbane, is valuable for the oil and fat which it contains, for its flesh which is cured, and its skin which is tanned.

Off the Great Barrier Reef, and on the shores of many of the tropical islands, the trepang is found in large numbers. The trepang, also known as the sea-slug, and *bêche-de-mer*, resembles a slug in appearance, and varies in length from 6 to 24 inches. It lives among the coral rocks, and when caught, is pressed between stones, dried in the sun, smoked, and then exported to China, where it is esteemed a great delicacy.

Introduced Animals

Sheep.—Australia is deficient in inland rivers and is subject to periods of drought. This interferes with the progress of agriculture and is detrimental to cattle pastures. Sheep pasture suffers less from want of rain than cattle pasture, and hence the greatest of all Australian products is wool. Sheep were the foundation of the prosperity of the continent and are still the basis of her greatest industries. Millions of pounds' worth of wool are exported every year. In no country has wool-raising reached a higher standard of perfection than in Australia. The Australian output now dominates the wool markets of the world, and buyers from England, France, America and Germany annually attend the great auction sales at Melbourne, Sydney, and Geelong.

The foundation of the wool trade in Australia was laid in 1797, when some very good sheep were imported from Cape Colony. Among the imported animals were several rams and ewes that had been presented to the Dutch Government at the Cape by the King of Spain. These animals were the ancestors of the merino herds of Australia from which fleeces of a very fine texture are obtained. The wool of the merino is in all countries silky and brilliant, but so well are the climate and the grass of Australia suited to the merino, that the fleece is finer than that obtained in any other part of the world.

The country on which the sheep are fed varies very considerably. In parts of the west of Victoria, the sheep can be seen standing almost knee-deep in thick tender grass. In the tract of land between the Darling and the Murrumbidgee

bidgee—the Riverina—they may be seen contentedly finding a meal on acres of land that would appear to contain about as much pasture as an asphalt court. West of Bourke they mainly subsist on the salt-bush. There are several native plants which sheep will eat when grass is unobtainable.

The sheep stations vary in size and in character. As a rule, the nearer the sheep station is to the coast, the smaller is the sheep run, and the larger and more elaborate are the farmhouses and out-buildings. As you travel west, the runs increase in size and the homes diminish in comfort. A really large sheep run may be 500 or even 1,000 square miles in extent and carry from 70,000 to 100,000 sheep. A succession of good seasons will make the sheep owner a rich man, while two or three dry seasons will ruin him. In fact, the great drawbacks are floods and droughts. In 1902, a long dry season in New South Wales resulted in the loss of 306,000 cattle, 36,000 horses, and 15,000,000 sheep, while rabbits died by millions. During recent years attempts have been made to store up water for the dry seasons, and these have been attended with considerable success. Artesian wells are now being bored, often to a great depth, in order to tap the water-bearing stratum underlying a large part of the plain country of Queensland and New South Wales. These artesian wells are amongst the great blessings that Australia has received, and there are now hundreds of them in Queensland and New South Wales.

Wool is the most important product of all the Australian States with the exception of Western Australia, where, however, it is of great importance. New South Wales has as many sheep as all the rest of Australia. The best grazing ground is in the district between the Murray and the Darling. In Western Australia the best sheep-grazing regions lie on the banks of the Fitzroy River, and along the coast ranges of the south-west. New Zealand has many sheep, and the export of wool and frozen mutton is of great value. In spite of the fact that New Zealand supplies Great Britain as well as other colonies with large quantities of frozen mutton, the flocks continue to increase at a satisfactory rate, a result which is due to the excellent pasture

the colony possesses, and to the fact that New Zealand does not suffer from drought.

Cattle are found in all the states, but most of all in Queensland, where the rainfall is more abundant and the heat greater than that of the other Australian states. Wherever cattle are reared, either in Australia, Tasmania, or New Zealand, there are exports not only of the animals themselves, but of frozen meat, hides, skins, tallow, butter, and cheese. In some districts oxen are used for draught on the farms.

Horses are bred in all the states, but New South Wales raises the largest number; Queensland the next.

The Indian Army obtains remounts largely from Australia; an Australian horse being commonly called a "Waler" in India. The coastal plains of New South Wales, the Gippsland district (Victoria) and the plains between Perth (W.A.) and Albany all produce fine breeds.

South Australia offers good horse-breeding country, as the climate and the grass of this state are unequalled for the production of hardy animals. The tableland country is well adapted for the raising of horses of any type, from ponies to draught stock. The largest horse sale in Australia is that held annually at Kapunda, a town 50 miles north-east of Adelaide, 2,000 horses often being sold by auction in a few days.

The development of horse breeding was promoted by the large purchases of horses for military purposes, which were made at the beginning of the Boer war. The Japanese have also bought thousands of useful Australian horses.

The Camel has been introduced with great success for transport purposes in the dry areas. Not only is the camel used as a pack animal, as in Asia and Arabia, but it has also been trained to draw wagons.

The Rabbit has increased to such an extent, that in places it eats up all the grass, and the sheep have to be moved to fresh pastures. One gets so accustomed to strange animal freaks and curiosities in Australia, that one is not surprised to hear that in districts where the grass has been almost entirely eaten, the rabbit is learning to climb trees in search of food. Tremendous efforts are put forth to keep the animal in check. Miles upon miles of pasture

are fenced in with wire netting; prepared poison pellets are strewn wherever they are likely to be eaten; rabbit trappers and dogs are kept busily employed.

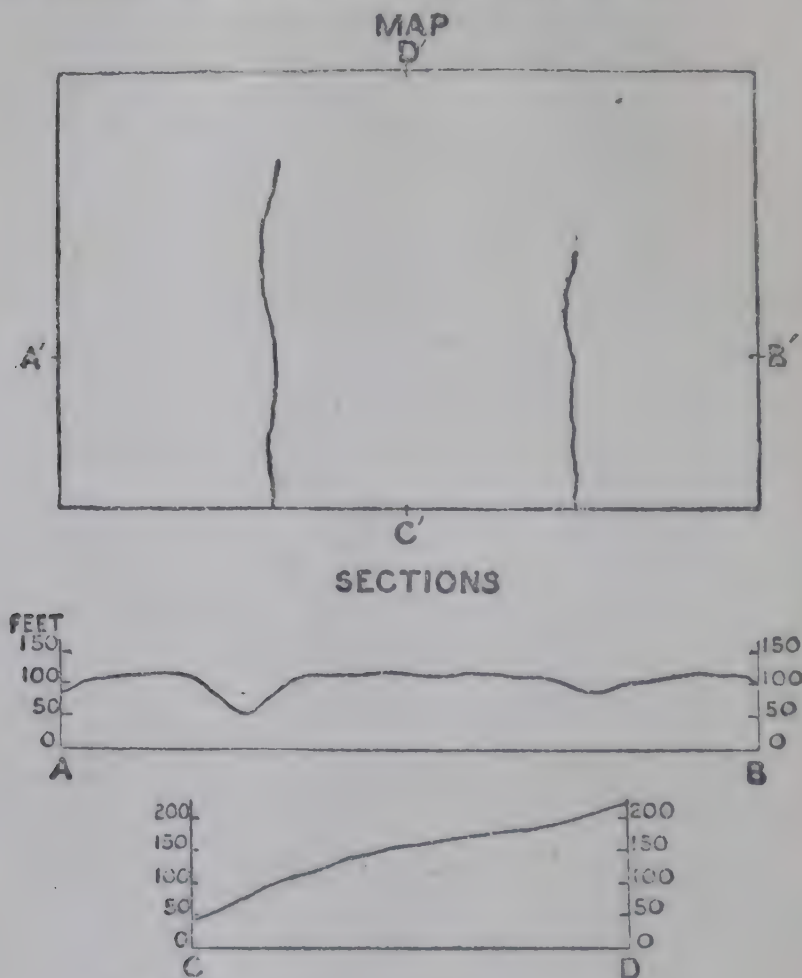


FIG. 62.—CHAPTER XXX, EXERCISE 1.

Fortunately there is some slight recompense in the fact that rabbits can be frozen and sent to London for food, and that the hat mills in France and other countries find the skins suitable for their purposes. Local hat mills also use rabbit fur for felt hats; the skin, after the fur has been removed, is used for making gelatine. There is also a very large local consumption of rabbits for food.

REVISION EXERCISES

1. On the accompanying diagrams (Fig. 62) AB and CD represent sections taken respectively in the direction A'B' and C'D' on the map.

Draw on the map the probable course of the 100 foot contour line.
C. J., 1904.

2. Name and state the position of five of the chief ports of China and note from what region each derives the principal goods it exports.
L. J. S., 1906.

3. Draw a sketch-map of Australia, inserting (a) the frontiers and capitals of the political divisions, (b) the Great Barrier Reef, Cape York, the Murray, Bass' Strait.
O. S., 1902.

4. "Stock-farming will probably always be the most important occupation in large parts of the British Empire."

State generally the positions of some of the chief regions of which this is true, and explain the geographical conditions which are likely to prevent development in other directions.
O. S., 1906.

5. Which are the chief wool producing regions of Australia? Compare Australia as regards this industry with other wool-exporting countries.
O. J., 1898.

CHAPTER XXXI

MINERALS

AUSTRALIA is very rich in minerals, the most important being gold, silver, copper, tin, coal, and iron, of which the principal is gold. There are other mineral deposits, such as manganese, antimony, cinnabar, and precious stones (garnet, ruby, sapphire, opal). The marvellous progress and prosperity of Australia are largely due to the enormously rich gold mines of Victoria, Queensland, New South Wales, and Western Australia, the productive copper mines of South Australia, the valuable coalfields and rich silver mines of New South Wales, the famous tin mines of Tasmania, and to extensive deposits of other useful and valuable metals and minerals.

Gold is found in all the states. The chief gold states are West Australia, Queensland, and Victoria. The richest fields are at Kalgoorlie in Western Australia, at Charters Towers and Mount Morgan in Queensland, and at Ballarat, Beechworth, Castlemaine, and Bendigo (Sandhurst) in Victoria. Gold is also found in New Zealand.

When gold was first discovered in these colonies, tens of thousands of men deserted their regular work, and, wild with excitement, rushed to the diggings, where they practically picked up wealth from the old gravel beds on the surface which had been formed from the gold-bearing

quartz rocks by rain and wind. When the surface deposits were exhausted, they had to mine deeper, and at the present time shafts have to be sunk to great depths to reach the quartz reefs. The quartz blocks are crushed by machinery, and the metal extracted by chemical methods.

The importance to Australia of the discovery of gold within her territory is far greater than the worth of the gold itself. It has been the means of bringing to her shores hundreds of thousands of enterprising men, who, on leaving the gold-fields, have settled down in the country, to gain a livelihood, if not a fortune, by steady industry in some useful employment.

Silver is the characteristic metal of New South Wales, but it is also found in the Lofty Range of South Australia, in Queensland and Tasmania. In New South Wales the chief silver mining towns are Silverton and Broken Hill. Broken Hill is the most important mining town in the state, and stands amidst the Barrier Ranges close to the South Australian border. Twenty-five years ago the site of the city was a dreary forbidding sheep-run. The town is connected by rail with Port Pirie, noted for its smelting works and Adelaide.

Copper is found in New South Wales, South Australia and Tasmania. There are great deposits of the ore in the mountains, on the coast of Spencer Gulf. The chief mining centres are at Wallaroo, and Moonta.

Tin, the characteristic metal of Queensland, is mined at Herberton and Stanthorpe, and also in Tasmania.

Coal and Iron.—There is an abundance of coal along the east coast, most of which is of good quality.

New South Wales is said to be one vast coalfield for hundreds of miles along the coast, and as the coal is often associated with immense quantities of iron ore, this colony will inevitably become the great manufacturing state of the continent. The great coal port is Newcastle.

Victoria has large supplies of coal in Gippsland, which is stated to be of excellent quality for steaming and household purposes, and Queensland has extensive coal areas, that are, however, but little worked. The principal mines are at Ipswich.

Coal is found in Tasmania and New Zealand. The best coal in New Zealand is found in the Nelson province, but much brown coal is obtained in Auckland and Otago.

Iron is found in all the colonies, but not usually near beds of coal. The cost of production and of carriage is so great that it rarely pays to mine the ore.

Below, for reference purposes only, is given a list of the colonies and their chief mineral products.

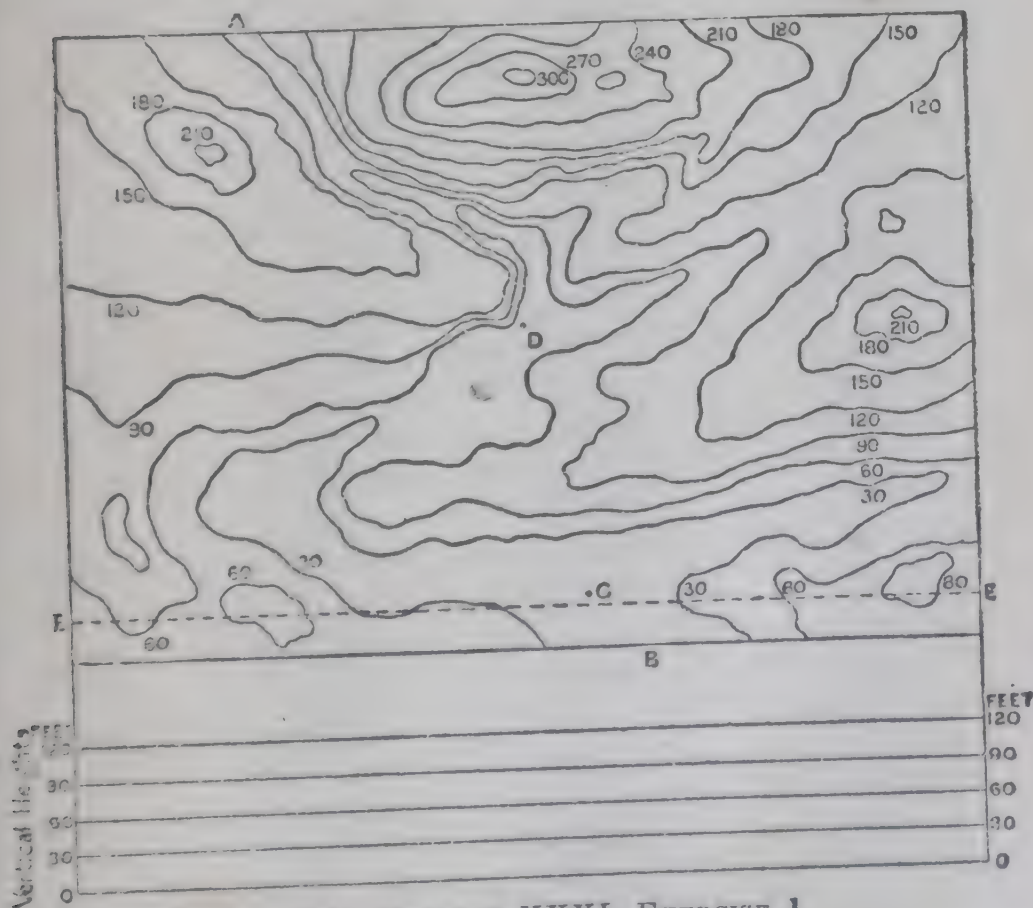


FIG. 63.—CHAPTER XXXI, EXERCISE 1.

New South Wales.—Coal, silver, gold, tin, zinc, copper, diamonds, marble, bismuth, building-stone, fire-clays, opals, slates.

Victoria.—Gold, silver, tin, iron, coal.

Queensland.—Gold, copper, tin, coal, silver, lead, quick-silver, opals.

South Australia.—Copper, silver, tin, gold.

West Australia.—Gold, copper, coal.

Tasmania.—Tin, gold, copper, coal, silver.

New Zealand.—Gold, coal, iron, silver, copper, building-stone, marble, graphite.

New Guinea.—Little is known of the mineral resources of New Guinea, but gold has been found, and coal and plumbago are said to exist.

REVISION EXERCISES

1. On the accompanying map (Fig. 63) the configuration of the ground is shown by contour lines at vertical intervals of 30 feet. A stream runs from A to B and is joined by tributaries at C and D. Show by thick lines the probable courses of the stream and its tributaries, and draw a vertical section of the country from E to F in the space provided below the map.

2. Write a brief account of the physical features, climate and natural productions of the Ganges Basin. L. J. S., 1906.

3. On a map of Australasia insert the Tropic of Capricorn; write the name of each state in its proper place, but do not show the boundary; mark and name Sydney, Melbourne, Brisbane, Coolgardie, Newcastle; shade the deserts; write sugar, wheat, copper, artesian wells over the areas where these are found.

Civil Service, Supplementary Clerks' Exam., Sept., 1907.

4. State the most important region where coal is found in Australia. State the uses to which the coal is put, and the position of the chief centre where it is consumed or exported. L. J. S., 1906.

5. State shortly (a) the chief sources of natural wealth in Australia, (b) the chief climatic and other drawbacks to the country.

O. J., 1901.

CHAPTER XXXII

DISTRIBUTION OF POPULATION. OCCUPATIONS.

EXAMINE the map (Fig. 64) showing the distribution of population in Australasia. Notice that there is no extensive area in any part of this region where the population is over sixty-four per square mile.

Compare this figure with the one showing the distribution of the vegetation. Where is the population under one per square mile? What is the character of the vegetation of these parts? It is obvious that the population in the desert is not likely to be ever a great one, but why should parts of the grass-lands be so thinly populated? Is it likely, do you think, that the population upon the thinly peopled parts of the grass-lands will ever increase

to a very large extent? In what parts of Australasia is there a population of from one to eight per square mile? What is the nature of the vegetation in these regions? What connexion do you observe between the density of the population and the character of the vegetation? Where



FIG. 64.—AUSTRALASIA: POPULATION.

is the population from thirty-two to sixty-four per square mile? Account for this.

The occupations of the people in the areas under consideration are easily described. Leaving out New Guinea, we can say that in the deserts there are no people and therefore no occupations; that in the grass-lands the people are engaged in stock raising; that in the mountainous districts where minerals are found, there is a certain amount of mining; and that in certain other districts, more or less near to the coast, the people are agriculturalists.

The great sheep farmers are called "squatters," and they are, perhaps, the most wealthy class in the country. They may be regarded almost as "shepherd kings." A wealthy

squatter can count his sheep by the tens of thousands, and measure his sheep-run in many square miles. The house of a squatter is his "homestead" and is usually far from the coast, and also far from a town. Very often the nearest neighbour lives 40 or 50 miles away. The house is sometimes of wood and one story in height, but in rich country, such as the Western District of Victoria, the homesteads are very large and handsome mansions of brick or stone costing from £10,000 to £20,000, lighted by electricity, or more often by acetylene, for which they have their own plant and are connected by telephone with the neighbouring stations, the nearest township or the metropolis. Some of them have electric apparatus for cooking, etc., and refrigerators. Attached to the station are a number of barracks for bachelors and for the young men who are learning the business of sheep farmers, or earning their living by working upon the farm.

The work of the young men is full of freedom, but is of a very laborious nature. "Much of their time is spent amid dust and grease, tar and oil, wool and skins. They must know how to handle and doctor sheep; how to wash, shear, slaughter them. They must be able to muster sheep, collecting them from the vast pastures on which they feed, to detect the weak ones at a glance, and to count the flock—no easy matter when there are thousands—with speed and accuracy. They must be able to live in the saddle. In the management of horses they must excel. Each must be capable of catching his own horse, which is probably never stabled, groomed, or shod; and, above all, he must know how to retain his seat in spite of the many tricks the horse is sure to practise until the rider has proved his mastery."

Fill up the following table :

Occupation.	State.	Chief Centres.

Manufactures cannot be said to be of any great importance as yet, and in certain directions it does not seem as though Australia or New Zealand would ever be great manufacturing countries, for the climate is quite unsuitable for fine textile work.

The chief manufacturing state is Victoria. In 1905 there were 4,300 factories employing about 80,000 hands, a considerable number in proportion to the population. Each state has certain small manufactures of articles needed for local consumption.

Woollen Goods.—Sydney, the wool coming from the extensive sheep pastures near at hand.

Castlemaine, (Victoria).

Geelong, near the sheep pastures of Western District, has a semi-marine climate.

New Zealand has excellent wool mills.

Ipswich (Queensland) has a small tweed industry.

Leather Goods.—Sydney. Cattle are reared on the pasture lands. The bark for tanning is obtained from the acacias that cover such large areas in the state. Both Sydney and Melbourne have large boot and shoe factories.

Goulburn makes leather and boots. This town is in the centre of the southern inland trade. Wheat and other valuable products are grown in the district.

Furniture.—Sydney. Cedar for furniture, and rose-wood and tulip wood for cabinet making, are obtained in the eastern forests.

Soap and Candles.—Most of the large towns on the east coast.

Agricultural Machinery.—Most of the large towns in Victoria and South Australia.

Iron.—Lithgow, in a glen in the Blue Mountains, mines coal, and smelts copper as well as iron.

Sugar is made in most of the coast towns north of Grafton.

Mackay is the chief sugar centre in Queensland.

Wine is made in (a) New South Wales, in the district between Maitland and Tamworth and in the Albury district. On what rivers do these towns stand? (b) Victoria, between Stawell and Echuca, and also round Rutherglen in the north.

Echuca is a busy place at the junction of two

rivers. Name these rivers. A railway connects Echuca with Melbourne, and cargoes are landed here for transport by rail from steamers both ascending and descending the river. (c) In South Australia round Adelaide.

Butter is made in a very large number of centres. The Western District and Gippsland in Victoria are important dairying centres.

REVISION EXERCISES

1. Describe clearly what is meant by an anti-cyclone. When there is an anti-cyclone over Denmark, what is the probable character of the weather in England? C. S., 1902.

2. Give the names of six of the chief coalfields of the United Kingdom. Name the principal industry connected with each, and one large town situated upon it. C. J., 1904.

3. State and account for the occupation of the people in any three of the following regions, and point out whether the population is dense or not in each of the three regions selected: Jamaica, Pampas, Selvas, Tundra, Steppes, Plains of China, German South-East Africa, Egypt, Sudan, Western Australia. L. J. S., 1905.

5. Explain where grass and scrub lands are found in Australia, and the occupation of the people on these lands. L. J. S., 1907.

CHAPTER XXXIII

COMMERCE

IN proportion to her population, Australia does more trade than any other part of the world. The trade consists chiefly in exchanging wool and gold for manufactures and luxuries.

New South Wales does the greatest amount of foreign trade. The imports are articles of food and drink, clothes, iron and metal goods, and other manufactured articles, tea, etc. The Australians are amongst the greatest tea drinkers in the world.

The chief exports are wool, gold, coal, meat, live stock, tin, silver, copper, skins, tallow.

Sydney, the capital, and largest town in New South Wales, is the chief port. On what harbour does it stand? The entrance to the harbour is strongly fortified, and the depth of water is so great that the largest vessels can lie close inshore. Sydney is so beautifully situated and has such splendid buildings, gardens, and streets, that its title of the "Queen of the South" is well earned.

Newcastle.—At the mouth of what river? The harbour is protected by a breakwater. Newcastle is a coal and wool port.

Wollongong ships dairy produce and is also an important coal port.

Grafton. On what river? This is an outlet for sugar, agricultural produce, and live stock.

Victoria exports wool, gold, butter, bread stuffs, live stock, frozen meat, leather, machinery; and imports wool, live stock and coal from the neighbouring states; cotton and woollen goods, metal and metal goods, principally from the United Kingdom; tea, sugar, etc.

Melbourne, the capital, is the second largest town in Australia. On what river is it? Near what bay? Melbourne has splendid public buildings, beautiful parks, and lovely gardens. "Sixty years ago no white man had trodden the ground on which this vast city now stands, and little did the settlers of 1835 think, when they built their mud huts on the then solitary banks of the Yarra, and surveyed the immense and desolate meadows around them, that in half a lifetime a colossal city would cover them, that the dreary spot which they bought from the black fellows for two blankets and a bottle of spirits would be the site of the ninth largest city in the British Empire, and its citizens would fain assert, second only in commercial importance to the great imperial city itself."

Geelong.—On what bay? What does it manufacture? In the neighbourhood heavy crops of onions, peas, and beans are raised. It is an important wool port.

Portland, the oldest town in the state, exports the produce of the surrounding agricultural district.

Queensland trades chiefly with the other Australian states, and next to them, with the United Kingdom. The exports are wool, gold, frozen meat, sugar, live stock, hides and skins, tallow, pearl shells, fruit, butter, tin, copper, and silver. The imports from the United Kingdom and America include all kinds of manufactured goods, agricultural implements, and tools.

Brisbane.—On what river? Into what bay does the river flow? Brisbane is the chief port of Queensland,

and has a delightful climate and equally delightful scenery. Its trade depends on the pastoral and agricultural wealth of the Darling Downs, wool, wheat, and wine.

Maryborough exports the gold of the Gympie goldfields, timber, and cattle.

Rockhampton exports gold and has important meat-preserving works. On what river is Rockhampton?

Townsville exports the gold of Charters Towers, and sugar, and also serves as an outlet for an extensive pastoral region.

South Australia trades with the United Kingdom, New South Wales, and the other Australian states. The exports are wool, wheat, flour, copper ore, and wine. The imports are farm implements, beer and spirits, cotton and woollen goods, clothing, and machinery.

Port Adelaide is nine miles from Adelaide, for which place it serves as a port. On what gulf is Port Adelaide situated? From the port to the capital there is one unbroken line of villas.

Port Augusta has a fine natural harbour and is rapidly becoming an important wheat and wool port.

Port Pirie is the chief wheat port of the country.

Wallaroo exports the copper of the famous Wallaroo copper mines.

Palmerston is the capital and chief port of the Commonwealth or Northern Territory, and is situated on Port Darwin, a splendid natural harbour. It exports the gold from Pine Creek, and the sugar-cane, cotton, maize, and tobacco of the neighbouring plantations.

Western Australia exports gold, timber, sandalwood, wool, pearl shells, hides and skins, and tin, and imports manufactured goods.

Fremantle.—At the mouth of what river? This is the port of Perth, an important industrial and commercial centre, and the chief port of the state.

Albany. On what harbour is it. All the great "liners" used to touch here at one time, but the harbour at Fremantle has been deepened, and the trade and importance of Albany have somewhat declined in consequence.

Tasmania exports wool, gold, fruit, jam, potatoes,

timber, bark; hides, skins, sheep, and horses; and imports textile fabrics, hardware, tea, and sugar. The export fruit trade has been developed since 1890. In 1911 the State shipped nearly a million cases of apples to this country.

Hobart.—On the estuary of what river? At the foot of what mountain? The harbour is one of the finest in the Southern Hemisphere. It trades chiefly in agricultural produce with Sydney.

Launceston is the only other large town in Tasmania. On what river is it? As the port is nearer Australia than Hobart, its trade is greater. Launceston smelts tin.

The Dominion of New Zealand exports wool, frozen meat, gold, butter, cheese, hides, skins, leather, phormium, (New Zealand flax,) kauri-gum, tallow, grain, pulse, and flour; and imports cloth and clothing materials, iron and steel goods, paper, printed books and stationery, sugar, spirits, wine and beer, tobacco and cigars, fruit, oils, tea, coal, fancy goods.

Auckland is a commercial centre, with meat and fruit industries. It is near one of the richest gold mines in the world. On what gulf does Auckland stand? The climate of this coast is that of the Riviera.

Wellington.—On what strait? The harbour of Port Nicholson is a safe one, and there is a large coasting trade. The trade is in wool and frozen meat. There are wool and meat industries.

Napier.—On what bay? Napier is a pastoral centre and exports wool and frozen meat.

Port Lyttleton is the port of Christchurch, with which it has railway connexion.

Dunedin, the "Edinburgh of New Zealand," is one of the most important commercial centres in the "Dominion."

Nelson.—On what bay? Fruit is exported to Wellington.

New Guinea exports gold, *bêche-de-mer*, copra, bird skins, pearl shells, rattans.

Port Moresby is the chief trading station.

Make a list of all the ports in this chapter, and fill up the following tables.

I

Port.	Country.	Imports.	Exports.

II.

Port.	Line of Steamers from England.	First Class Fare.	Length of Voyage.

Mark out on a map of the world the course of a steamer sailing from England to Australia, and fill up the following table :

Port of Call.	Where Situated.	Remarks.
Portsmouth . . .		
Gibraltar		
Malta		
Port Said		
Suez		
Aden		
Colombo		
Fremantle		
Adelaide		
Melbourne		
Sydney		

The mails for the Commonwealth are carried by the Peninsular and Oriental Company, and by the Orient Line. The White Star Line makes the voyage by way of the Cape

of Good Hope. Australia is also connected by steamer with San Francisco and Vancouver.

Mark out on a map of the world the course of the following telegraph lines and fill up the following tables :

Telegraph Station.	In what Country Situated.	Remarks.
London		
Penzance		
Lisbon		
Gibraltar		
Malta		
Alexandria		
Suez		
Aden		
Bombay		
Madras		
Singapore		
Banjowanjie (Java)		
Port Darwin		
Adelaide		
Sydney		
Auckland		

Another important telegraph route is as follows. Fill up a table similar to the above.

Telegraph Station.	In what Country Situated.	Remarks.
Newbiggin (Northumberland)		
Libau (Russia)		
Moscow		
Vladivostock		
Shanghai		
Singapore		
Banjowanjie		
Port Darwin		
Adelaide		
Sydney		
Auckland		

There is a cable between New Zealand and Canada, about 8,900 miles long. It passes via Vancouver and St. John's (Newfoundland), and thence to the south-west of Ireland.

If possible, obtain the time tables and charts of the following companies, showing the routes taken in going from Australia to New Zealand, and fasten them in your note-book :—

Peninsular and Oriental Steamship Company; Messageries Maritimes; North German Lloyd; New Zealand Shipping Company. Shaw, Savill and Albion Company; Union Steamship Company. The last three lines call at Teneriffe, Cape Town, and Hobart, and thence to all New Zealand ports. Ocean Steamship Company—Auckland to San Francisco.

REVISION EXERCISES

1. Distinguish the three great sea routes from England to Australia. Name the chief ports of call. O. S., 1893.

2. Where are the following places, and what geographical conditions have made them important: Aden, Batavia, Damascus, Hobart, Irkutsk, Kabul, Mukden, Rangoon, Singapore, Smyrna, Vladivostok? O. J., 1907.

3. A traveller has to go from London to Shanghai. State shortly the routes he would follow (a) starting eastwards, (b) starting westwards. O. J., 1900.

4. Between what parallels of latitude does Australia lie? Describe the routes from England to Sydney, naming six towns or other points of interest you would pass after leaving England. C. J., 1896.

5. A ship is chartered by the Australian colonies to call in geographical order at their chief ports to bring specimens of their most important raw materials of commerce to London; describe these ports and products. C. S., 1888.

CHAPTER XXXIV

RAILWAYS.

AUSTRALIA made railways almost before she made roads, and all the state capitals are now connected either by rail or telegraph.

Trace out on your own map, and mark with a thick line the Inter-Colonial Line that connects the great towns on the coast from Rockhampton to Adelaide

Adelaide is the capital of South Australia. On what river? Adelaide is clean, bright, and has beautiful buildings, fine avenues, shaded squares, and large parks. Through what port does most of the trade of Adelaide pass?

Serviceton.—On the border. Here the line joins the Victorian railway system.

The Grampians, with their varied and pleasing scenery, are next crossed.

Ballarat owes its prosperity to its gold mines, which are amongst the richest in the world. Here all the gold is obtained by mining the quartz reefs. Ballarat has other sources of wealth in the rich agricultural and pastoral district that surrounds the mines.

Melbourne, the splendidly laid out and substantially built capital city, is encircled with a network of rail and tram lines.

So far we have travelled on the Western System. We now take the North Eastern System and arrive at Albury on the frontier. What mountains and rivers are crossed between Melbourne and Albury?

Albury.—At Albury trains must be changed as the lines in New South Wales have a different gauge from those of Victoria. Albury is situated at the head of navigation, on the Murray. The dry climate is suitable for the making of raisins. The grapes grown are of exceptional quality, and Albury is noted for wine as well as for raisins.

Wagga-Wagga is a pastoral and agricultural centre at the head of navigation of the Murrumbidgee.

Goulburn makes leather and boots. Wheat and other valuable agricultural products are grown in the district.

Sydney.—The line from Albury to Sydney is the Southern Railway. Our journey north from the capital is on the Northern Railway.

Newcastle, the great coal port, ranks second among New South Wales ports.

Maitland is an agricultural centre where excellent grapes are grown on the sheltered south bank of the Hunter.

Tamworth is the chief place on the Liverpool Plains. Here tin is mined, and very fine wheat is grown. Tamworth is a railway junction.

Armidale mines gold.

Tenterfield mines tin.

In Queensland we travel to the capital on the Southern and Western Railway.

Stanthorpe is another tin mining town.

Ipswich has good coal mines and has a small industry for tweed.

Brisbane is the capital town of Queensland. On what river is Brisbane situated? Into what bay does this river flow?

Gympie mines coal and gold which are exported from Maryborough.

Maryborough.—The approaches to this port are interfered with by shifting sands and banks.

Bundaberg.—At the mouth of what river? This is in the sugar growing district and refines the raw product.

Rockhampton.—On what river? Rockhampton is a port commanding the gold and cattle trade of Central Queensland. Maize grows abundantly on the lowland of the neighbourhood.

The Transcontinental Line.—There is a proposal to carry a great line across the continent, following the track of the overland telegraph line from Palmerston to Adelaide. A portion of the line has already been constructed.

Mark the line on your map as follows. It begins in the extreme south-east of South Australia and runs to Adelaide crossing the Murray.

Kapunda mines copper. From this point a branch runs to tap the navigation of the Murray. Farther north a branch runs to the silver mines of Broken Hill.

Port Augusta.—At the head of what gulf? Port Augusta has a splendid natural harbour.

As the train speeds north, what mountains and lakes are passed?

Oodnadatta is the present terminus of this section of the line.

The northern section of the line (in the Northern Territory) is shorter.

Palmerston has a soil and climate suited for sugar,

cotton, and indigo. Gold is mined, and there are indications of tin, silver, and copper.

Pine Creek, the terminus of the northern section, is a gold mining centre.

Mark on your map the railway lines connecting the following towns with the capital of the state in which they lie.

Besides the proposed line from Adelaide to Palmerston of which the sections from Adelaide to Oodnadatta and from Port Darwin to Pine Creek are now open, it is proposed to construct a line to connect Adelaide, and so the railways of the eastern states and all the continental capitals, with the Western Australian railways which run from Perth to the Coolgardie and Kalgoorlie gold-fields. The Trans-Continental Railway Bill passed by the Federal Houses of Parliament in 1907 provides for spending £20,000 on a survey of this line. The cost of making the line has been estimated at over four and a half million pounds.

New South Wales. **Hay.**—On what river? As the land is naturally fertile, and as irrigation from the river is easy, arable farming is largely practised, and Hay is an important agricultural centre.

Bourke.—On what river? Bourke is a sheep farming and copper mining centre. In the wet season, the Darling is navigable to this point. In the dry season, water has to be obtained from artesian wells.

Bathurst is the centre of the chief wheat district in the state, and is also famous for its mines of gold and silver and its quantities of slate.

Wentworth is not yet a railway centre, though the neighbouring town of Mildura, in Victoria, is linked by rail with Melbourne. What two rivers join at Wentworth? The position of the town at the junction of the two rivers would of itself give Wentworth considerable importance. In the future, it may become one of the chief towns in Australia, for it is proposed to connect it with Sydney via Hay, and also with Adelaide via Morgan.

With the exception of the main trunk line along the coast, in what direction do the railways of N.S.W. run? What rivers do they connect with the coast? What mountains do they cross? The gradients on these lines are more than ordinarily steep.

Victoria.—Echuca. On what river?

Bendigo is a great mining centre.

Portland has an excellent roadstead.

Geelong is a seaport, with a tweed manufacture.

Queensland.—Mark the railway connexions of the following towns with the coast.

Charleville.—On what river?

Longreach.—On what river?

Hughenden.—On what river?

In what direction do the branch lines of the Queensland railways run? What rivers do they connect with the coast?

West Australia.—Mark the course of the following possible railway journey.

Albany.—On what harbour?

York, an agricultural centre. From York, Perth and Fremantle may be visited.

Coolgardie, Kalgoorlie and Menzies are gold mining centres.

The Dominion of New Zealand.—There are many railway lines in both North and South Island, and nearly all the large towns are connected by rail and telegraph. Mark the following main systems.

(1) Lines from Auckland with branches.

(2) Lines from Wellington.

(3) Lines from Christchurch, the City of the Plains. What is the port of Christchurch?

The longest railway line that can be drawn in New Zealand begins at Culverden and runs through Christchurch, south along the coastal plain to Invercargill. On what strait does Invercargill stand?

(4) A line connecting Christchurch and the coal port of Greymouth. This line is not yet completed. It will ultimately be connected with Nelson.

REVISION EXERCISES

1. The surveys from which maps are drawn usually depend chiefly on *triangulation from a base line*. Explain shortly what is meant by this.

O. S., 1907.

2. Select any five of the following places; describe the position of each, and point out how geographical conditions have helped to make it important: Algiers, Calcutta, Cairo, Irkutsh, Kiaochow. Lorenzo Marques,

Mombasa, Montevideo, Nagasaki, Port Elizabeth, San Francisco, Santiago, Shanghai, Teheran, Vladivostok, Victoria, Winnipeg. L. J. S., 1905.

3. Write a brief description of the physical features, climate, and natural productions of the Dominion of New Zealand. L. J. S., 1906.

4. Name and describe precisely the geographical position of any three ports in Australia. Point out how this position has helped to control the development of each port. L. J. S., 1904.

CHAPTER XXXV POLITICAL DIVISIONS

ALL the Australian States possess responsible government. The form of government resembles that of the United Kingdom. There is a parliament consisting of a Legislative Council, something like our House of Lords, and a Legislative Assembly, which corresponds to our House of Commons. Each state has its own prime minister and cabinet, but the King is represented by a Governor. Every man over twenty-one years of age has a vote in the election of members for the Legislative Assembly. Women have had the Federal Suffrage since the first Federal Parliament, and since 1908 the vote for the State Parliaments.

On January 1, 1901, the states of New South Wales, Victoria, Queensland, South Australia, West Australia, and Tasmania were united to form one Commonwealth. The Governor-General represents the King. There is a Senate consisting of six members from each of the six states, and a house of Representatives, whose members are distributed amongst the states, according to population. Every member of both houses receives a salary of £600 a year. The Federal Parliament controls the trade and customs, defence, postal and telegraphic services, railways, shipping, lighthouses, finance, currency, etc., but each state manages its own internal affairs. The Northern Territory, formerly administered by South Australia, has been taken over by the Commonwealth.

A site for the new Federal territory and capital has been acquired by the Commonwealth at Canberra in south-east New South Wales, distant about 200 miles from Sydney and 430 miles from Melbourne. Jervis Bay, about 120 miles to the east has also been acquired as a port for the capital, with which it will be connected by rail.

The "Flag of the Commonwealth" is the Union Jack on a blue or red ground, with a seven pointed star in one quarter, representing the six original states and the Commonwealth, and the Southern Cross.

New Guinea is now divided between Great Britain and Holland. The western half belongs to the Dutch; the north end and certain neighbouring islands formerly belonging to the Germans, together with Papua or British New Guinea, are under the administration of the Commonwealth.

The Dominion of New Zealand is divided into provincial districts, which are further subdivided into counties.

There are four provincial districts in North Island and five in South Island. Write down their names from your map.

REVISION EXERCISES

1. Explain the methods of representing the relief of a country on maps. Illustrate your answer by sketch-maps, and sections of some district which you have examined. *Leaving Certif. Exam., London Univ., 1907.*
2. State where five of the following places are situated, and point out any geographical features that have helped to make each of the five an important centre: Buenos Ayres, Cape Town, Hankau, Khartoum, Melbourne, Moscow, New York, San Francisco, Vienna, Wellington (N.Z.) *L. J. S., 1907.*
3. Show by a sketch-map and explain the distribution of rainfall in Australia. *L. J. S., 1907.*
4. Write a brief account of the configuration, the river systems, climate, and productions of Victoria. *L. J. S., 1905.*
5. Name and describe the position of the chief port of one of the following countries; what are the regions for which it serves as an outlet; what are the chief products shipped from it; and what advantages has the country for producing them: Cuba, Ecuador, Java, Tasmania, Togo? *L. J. S., 1905.*
6. Describe the physical features, climate, and products of Tasmania, or of the North Island of New Zealand. *L. J. S., 1907.*

CHAPTER XXXVI

RACES

As we have already seen, Australia possesses no indigenous, domestic, milk-giving animal, and no native fruit or food

plants of any great value to mankind. Hence the people who inhabited the continent before the coming of the Europeans were compelled by the character of their surroundings to wander continually in search of food. They were never able to settle down and become tillers of fields and builders of houses.

The aborigines of Australia, the "black fellows," are dark brown in colour, and often tall and well made. They have high cheek bones, broad noses, bright eyes, fine teeth, curly pitch black hair, and large beards. They wear little clothing but grease their limbs with fish oil.

They will eat snakes, insects, lizards, grubs, pine cones, or almost anything that their strong teeth can masticate. Their ordinary diet is little else but a few roots and berries with shell-fish. Some of the wilder tribes are addicted to cannibalism; perhaps in accordance with their ancient customs and superstitions rather than from scarcity of food.

They wear little or no clothing, and they have no fixed habitations. In the summer they live almost entirely in the open air, while in the wet seasons they build huts which are often little more than a few strips of bark. Their women, or "gins," are treated as beasts of burden, and are so hard worked that at thirty they look like old women.

These aborigines do not weave cloth, or make pottery. The instruments which they use in their simple occupations are made of wood or stone, or of the bones of animals or fish.

They have no religion, but are very superstitious. One of their beliefs is, that white men are the ghosts of their own people who have died, and they say that when they themselves come back to life again, they "will jump up all same white fellow," and lead a luxurious existence for evermore. This belief has more than once saved the life of the explorer who has come into contact with otherwise unfriendly tribes.

Intellectually, the condition of the aborigines is not a very high one. They cannot count beyond five. At the same time, they possess certain talents which have been developed to a very high pitch as the result of the lives they lead. For instance, they are clever hunters and fishermen, and their skill with the boomerang is marvellous. They

have exceedingly keen sight, and can follow a trail that an ordinary man would be unable to see. Some of them have found employment in the different states from time to time as shepherds, but as they are unused to a steady occupation, they almost invariably leave their flocks after a short time and take to the bush. In Queensland they have been employed by the police as "trackers," for discovering stolen cattle and criminals who have taken to the bush, but they are so cruel and bloodthirsty that their employment in these pursuits has to be steadily watched.

The tribes of the north are fiercer and wilder than the people of the south, but do not differ from them in their intellectual, moral, or social condition.

As they make no advance towards civilization, they are gradually dying out. There are a few hundreds in Victoria, perhaps a few more in New South Wales, South Australia, and Western Australia, but Queensland contains the greater number. The last of the Tasmanian aborigines died in 1876.

The native race of New Zealand is that of the Maoris, a brown-skinned, well-made, intelligent race. They are, in every respect, superior to the aborigines of Australia. Although they were originally cannibals, and prone to overmuch fighting, they have become agriculturalists and stock-raisers.

The Maoris to-day are most numerous in North Island, where there are large districts reserved to their exclusive use. At one time they were believed to be gradually dying out, a fact which they firmly believed, for they themselves said, "As the white man's rat has extirpated our rat so the European fly is driving out our fly. The foreign clover is killing our ferns, and so the Maori himself will disappear before the white man." But as a matter of fact, since 1896, their number has increased by nearly 8,000. Many of them have forsaken the habits of their forefathers; have become educated and have adopted the manners of the white man, engaging in trades and professions and taking part in public affairs. They are represented in the Dominion Parliament by men of their own race.

The inhabitants of New Guinea are the Papuans, i.e. "the woolly-haired," or "frizzled," and they are so called on account of "the huge frizzled out mop of hair that con-

stitutes the pride and glory of the Papuan," and which is sometimes as big as a guardsman's bearskin. At night a wooden rest is used under the neck as a pillow, in order that there may be no disarrangement of these precious mops.

The Papuan has a long face, a large prominent nose, projecting eyebrows, and rather slender legs. He is a hunter and a gardener, and like the Australian aborigine, is not over-particular as to the nature of his food. His chief amusements are "head hunting" and cannibal feasts. The Papuans have the reputation of being of a treacherous and murderous disposition.

REVISION EXERCISES

1. Describe the chief ways in which the different parts of the British Empire (leaving out India) are governed. Give examples of each.

O. S., 1907.

2. Which and where are the self-governing portions of the British Empire? What races of men are found in each?

L. J. S., 1904.

3. Describe the basin of the Murray-Darling system. State at what times of the year you would expect the river to be highest, and give reasons.

L. J. S., 1907.

4. In what parts of the world can we find the following tribes or races, or traces of their former existence: (a) Maoris, (b) Kaffirs, (c) Hottentots, (d) Aztecs, (e) Malays, (f) Eskimo, (g) Auracanian? In what parts of the world are the following creatures found: llama, condor, zebra, rattlesnake, kangaroo, emu, armadillo?

C. J., 1893.

5. What do you know of the native races of Australia and New Zealand?

C. J., 1899.

6. Where are the following, and what is their geographical interest or importance: Canterbury Plains, Tasman Glaciers, Torres Strait, Great Barrier Reef, Mount Morgan?

L. J. S., 1907.

7. Describe the situation and explain the importance of any five of the following places: Adelaide, Albany, Ballarat, Brisbane, Coolgarue, Dunedin, Hokitika, Littleton, Rockhampton, Sydney.

L. J. S., 1907.

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